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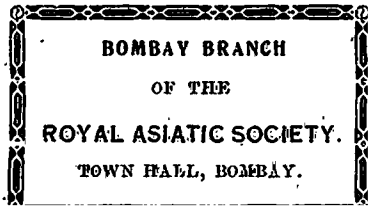

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REPORT

OF THE

HEALTH SURVEY AND DEVELOPMENT COMMITTEE

Vol. I

SURVEY

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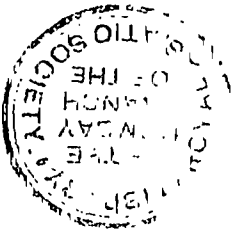

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REPORT OF THE HEALTH SUVERY & DEVELOPMENT COMMITTEE

VOLUME I

A SURVEY OF THE STATE OF THE PUBLIC HEALTH AND OF THE EXISTING HEALTH ORGANISATION

INTRODUCTION

The Health Survey and Development Committee was appointed by the Government of India in October 1943 to make (*a*) a broad survey of the present position in regard to health conditions and health organisation in British India, and (*b*) recommendations for future developments. The letter dated 25th October 1943 from the Government of India to the Chairman of the Committee in regard to its appointment and work is reproduced below and the press *communiqué* referred in the letter is given as Appendix 56 in Volume III of this report.

> "I am directed to forward a copy of the press *communiqué* announcing the appointment of the Health Survey and Development Committee. The terms of reference of the Committee will, as stated in the *communiqué*, be to make a broad survey of the present position in regard to health conditions and health organisation in British India and to make recommendations for future development. The terms of reference have been framed in general terms in order to leave the fullest possible freedom to the Committee in its treatment of the subject matter of the inquiry.
>
> 2. A survey of the whole field of public health and medical relief has not hitherto been attempted. The immediate necessity for initiating such a survey has arisen from the fact that the time has come to make plans for postwar development in the health field. The Government of India consider that such plans should be based on a comprehensive review of the health problem.
>
> 3. It will be observed that the terms of reference mention firstly a survey of existing conditions and organisation and secondly suggestions for future development. The Government of India regard the first item as of no less importance than the second. A survey which will give a general picture of the present position and which will indicate, and place in

proper perspective, the causes of a low level of health and the problems to be solved must be of the greatest value to all who are concerned with problems of health. A review which extended to all factors which have a direct or indirect bearing on the health of the community would cover a very large range of Government and private activity. The Committee has been constituted to review primarily those activities which can reasonably be regarded as falling within the scope of health administration. Turning to the question of future development it is unlikely that any committee would be able to produce within a limited period a solution for each of the many varied problems in the health field and it is recognised that in some cases the Committee may be able to do no more, within the limitations under which they have to perform their task, than to suggest various possible directions in which a solution may be sought or to indicate the need for further special inquiry. The Committee may wish to consider the question of indicating, where possible, both short-term objectives—objectives which might reasonably be expected to be reached within a period of four to five years—and objectives which will necessarily require a longer period for attainment.

4. One of the difficulties with which the Committee will be confronted is that of finance. Financial considerations clearly cannot be ignored. Plans based on the assumption that unlimited funds will be available for recurring expenditure will have little practical value. On the other hand it would be equally unwise to assume that expenditure on health administration will in the future be limited to the sums which were expended in the pre-war years. It is desirable, therefore, to plan boldly, avoiding on the one hand extravagant programmes which are obviously incapable of fulfilment and on the other halting and inadequate schemes which could have no effect on general health standards and which would bring little return for the expenditure involved.

5. The Committee will have power to appoint sub-committees for the consideration of particular subjects and to appoint to such sub-committees persons who are not members of the Committee but whose special knowledge of the subject matter of the inquiries will be of value.

6. War conditions must necessarily impose limitations on the Committee's activities and procedure. The difficulties of obtaining accommodation in the large towns and the necessity for restricting railway travel will make it impracticable for the Committee as a body to tour. It will be possible for small groups or sub-committees to visit particular places for a specific purpose but it is hoped that in view of the prevailing conditions the number of members of such groups or sub-committees will be restricted to the minimum. Reference should also be made to the collection of statistical and other material. Most provincial administrations have already a very

heavy burden to bear owing to the abnormal conditions and it will be difficult for them to collect voluminous statistics and other material specially for the Committee. Provincial Governments, however, have a large amount of material readily available in published reports or elsewhere and it is hoped that the Committee will find that such material will in most cases be adequate for the Committee's purpose. It will of course be possible for the Committee to supplement the information available in such reports by examining selected witnesses.

7. Reference has been made above to the preparation of plans by Governments for post-war development. It is clear that, if the cessation of hostilities is not to find Governments unprepared, the completion of such plans cannot be long delayed and it is, therefore, important that the results of the Committee's inquiry should be available as soon as possible.

8. The Government of India are aware that the task which they have entrusted to the Committee is one of great difficulty. The great range and variety of problems which go to make the single problem of preventing and curing disease and raising the general standard of health of the community, the varying conditions and stages of development in different Provinces, and the special needs of urban and rural areas and of the industrial and agricultural populations, are all factors which make the subject to be investigated a matter of great complexity. In addition the difficulties must inevitably be enhanced by the present abnormal conditions. The Government of India are satisfied, however, that the time has come when the inquiry must be undertaken and I am to express their gratitude to you and the members of the Committee who, in spite of other heavy claims on their time, have agreed to serve on this Committee."

2. We addressed ourselves to the task before us by dividing the wide field to be covered between 5 Advisory Committees dealing with the subjects of (i) public health, (ii) medical relief, (iii) professional education, (iv) medical research and (v) industrial health.

These Advisory Committees, which were composed of members of the Health Survey and Development Committee and of *ad hoc* co-opted members specially qualified to assist them in their task, were entrusted with the work of conducting detailed investigations into the subjects allotted to them, close liaison between them being ensured by inter-committee meetings and by periodic joint discussions. The composition of these Advisory Committees is shown in Appendix 57. It was felt necessary for the Health Committee to establish contact through tours in the Provinces with actual health conditions in the country and put to the test of such personal investigation as might be possible the character of the health services available to the public. For this purpose, the Committee was divided into 4 groups whose tours covered every Province in India except Assam and Baluchistan. Owing to the

limitations imposed by existing difficulties in connection with travelling and accommodation and by the over-riding time factor, touring had inevitably to be of a very restricted nature both in regard to the ground covered and the time expended. The necessity for the presentation of our report as early as possible had been repeatedly emphasized and any detailed examination of medical institutions, health conditions and the various health services open to the public, which would have postulated close and extended investigations, was therefore impracticable.

It may be remarked that the Goodenough Committee in the United Kingdom, with very much more restricted terms of reference covering as they did only the subjects of medical education and research and dealing with a country much smaller and more homogeneous than India, took about 26 months to complete its task. We have taken the same period of time to produce our Report which covers a much wider field and deals with more complex and difficult conditions. The visits paid to the Provinces had, for the reasons stated, perforce to be shorter and more cursory than we should have liked them to be. Nevertheless even these visits served a most useful purpose in disclosing defects and lacunae in the medical services available to the country, in showing some of the more important weaknesses in the existing medical and public health organisation and in establishing contact with interested public opinion, professional and otherwise, at various centres in the country.

3. A list of subjects under our consideration was prepared in some detail and copies of it were circulated to the Provincial Governments with a request for comments and suggestions in regard to any in the wide range of subjects included in the list. Individuals and organisations were invited to give written and oral evidence before the Committee's touring groups in respect of any particular problems in which they might be specially interested. Detailed questionnaires were drawn up by the Advisory Committees and were sent to the Heads of Medical Departments in the Provinces, to the Principals of Medical Colleges, Superintendents of Hospitals, Public Health Authorities, all Medical Associations in the country and to a number of individual medical men and social workers in the Provinces. As a result of these requests for evidence, criticism and suggestions, over 200 memoranda were received and about 450 witnesses offered themselves for examination by the Touring Groups, the Advisory Committees and the main Health Committee itself. Information in regard to the written memoranda considered by us is given in Appendix 58 of Volume III. Wherever it was possible to draw upon the experience of professional men and social workers outside our own ranks, the various Advisory Committees took full advantage of this source of assistance. Expert Committees composed of such individuals with special knowledge or experience of the subjects concerned were constituted to advise them in regard to basic medical education, dental education, pharmaceutical education, tuberculosis, mental hygiene and medical research. A special conference of

representatives of the nursing profession in India was held under our auspices to survey existing conditions and make recommendations for the future. We also had the privilege of discussions with Mr. Yeatts in regard to vital statistics and the population problem and with Professor B. P. Adarkar on the subject of medical benefits for workers. We desire to express our deep sense of obligation to all those who gave so freely of their time, and at considerable sacrifice of personal convenience, travelled long distances to place their great technical knowledge and experience at our disposal in connection with our work.

At an early stage of our deliberations, we recognised that a study of the health work and services in foreign countries would be of the utmost value in formulating our own proposals. This, however, was found to be impracticable. Not only did the limitations imposed by the time factor render this so but the difficulty of transport for what would have had to be a considerably large and representative delegation of the Committee, put visits abroad out of the question under existing conditions. The next best course had, therefore, to be adopted and 6 distinguished workers in the medical world from the United Kingdom, the United States and Australia were invited to come to India to assist us in our task. They were followed later by a representative of the Soviet Government and the Committee had the benefit, at an early stage of its sittings, of meeting Professor A. V. Hill, F.R.S., and discussing with him problems pertaining to medical education and medical research. The main object of inviting these visitors from abroad was not to seek advice in regard to our own peculiar problems but to obtain from workers of the highest standing in their respective countries with practical experience of many common problems, information as to how these were being dealt with elsewhere, what difficulties had been experienced and what the trends of thought were in countries most advanced in providing medical and public health services for their people. Further, by showing them conditions as they exist in India, we hoped to ascertain how far these conditions were comparable with those prevailing in their respective countries so that we might be able to draw, with greater confidence, our own conclusions as to how far measures adopted elsewhere were likely to be fruitful in the case of India.

In regard to Russia, we were particularly anxious to know something about the conditions which prevailed before the drive began to improve medical and health facilities for the Russian people, how far those conditions approximated to conditions prevailing at the moment in India and by what measures the great success that has been attained under the Soviet regime in this regard was achieved.

We wish to record our debt of gratitude for the most valuable assistance we have derived from our contact with these visitors and the detailed information which they made available to us through an examination conducted by us over many days.

Nor must we forget to mention the most valuable help we received from Lt.-Col. C. A. Bozman, I.M.S., the Acting Public Health Commissioner and Lt.-Col. D. P. McDonald, I.M.S., without whose ungrudging assistance we should not have been able to complete our task in the time that we have.

A part-time committee such as ours is peculiarly dependant on its Secretariat and we feel we must make specific mention of the willing and efficient help we received from ours. To Dr. K. C. K. E. Raja, our Secretary, we owe a very special debt. His knowledge, experience and capacity for work proved to be a never-failing reservoir from which we drew heavily at every turn. We desire to make specific acknowledgment of the invaluable assistance he has given to us. We should also like to express our warm appreciation of the work of our Assistant Secretary, Mr. Dwarka Dass, who kept the machinery of our Secretariat working at a remarkably high level of efficiency under most difficult and trying conditions.

Finally, to our Joint Secretaries, who never spared themselves, we are also greatly indebted for their devoted labours.

CHAPTER I

A BRIEF SURVEY OF THE STATE OF THE PUBLIC HEALTH

1. In this volume of our report we shall attempt to draw a picture of the state of the public health in the country and of the existing health organisation. While the succeeding chapters will deal with various aspects of health administration in some detail, we shall endeavour here to give a bird's eye view of the situation. In attempting to do so it seems essential to exclude the abnormal conditions which arose out of the world war. The entry of Japan into the war in December 1941 marked the stage at which war conditions began to have serious adverse effect on India. The statistical and other information, which have been included for the purpose of throwing light on the state of the public health, have generally been limited to the year 1941 and the preceding period of ten years.

2. The term health implies more than an absence of sickness in the individual and indicates a state of harmonious functioning of the body and mind in relation to his physical and social environment, so as to enable him to enjoy life to the fullest possible extent and to reach his maximum level of productive capacity. In every community there are three classes of persons, namely, those whose level of health is so low that they are victims of disease, others who, while they manifest no definite signs of sickness, are yet so devitalised that the possible range of their physical and mental achievements is considerably restricted and a third class consisting of those who are blessed with an abundance of life and vigour. An assessment of the state of the public health in a country should, therefore, be based on information relating to all these three classes of people. But data regarding positive health are more difficult to collect than those relating to sickness and mortality and, in all countries, statistical and other information regarding the former is available on a much more limited scale than information in respect of the latter. This is particularly so in India, and in the brief review of health conditions presented in the succeeding paragraphs, attention will be confined mainly to statistics of ill-health and death.

TABLE I.—*A comparison of Indian mortality rates and expectation of life with those of certain other countries*

Serial No.	Country	Death rate (1937)	Infantile mortality rate (1937)	Expectation of life at birth	
				Males	Females
1	New Zealand . .	9·1	31	65·04	67·88 (1931).
2	Australia . . .	9·4	38	63·48	67·14 (1932-34).
3	Union of South Africa .	10·1	37	57·78	61·48 (1925-27). (European population).
4	Canada . . .	10·2	76	59·32	61·59 (1929-31).

TABLE I.—*A comparison of Indian mortality rates and expectation of life with those of certain other countries*—contd.

Serial No.	Country	Death rate (1937)	Infantile mortality rate (1937)	Expectation of life at birth	
				Males	Females
5	United States of America	11·2	54	59·12	62·67. (White population).
				47·55	49·51. (Negro population). (1929-31).
6	Germany . . .	11·7	64	59·86	62·75 (1932-34).
7	England and Wales .	12·4	58	58·74	62·88 (1930-32).
8	Italy	14·2	109	53·76	56·00 (1930-32).
9	France . . .	15·0	65	54·30	59·02 (1928-33).
10	Japan	17·0	106	44·82	46·54 (1926-30).
11	Java	18·8			
12	Palestine . . .	18·9	153		
13	Federated Malay States	19·9	147		
14	Ceylon . . .	21·7	158		
15	*British India* . .	22·4	162	26·91	26·56 (1921-30).
16	St. Settlements . .	22·5	156		
17	Egypt	27·2	165		

3. It will be seen that India's death rates for the community, as a whole, and for infants (children under one year of age) rank high in comparison with the corresponding rates of most of the countries mentioned above. The rates relate to 1937 because they are the latest available from the annual epidemiological reports of the League of Nations. Similar rates for British India in 1941 were 21·8 per 1,000 population and 158 per 1,000 live births; they do not affect the position of India in the tabular statement. The level of health in the country, as judged by these rates, is therefore low. The figures for expectation of life tell the same tale because they express, in terms of the probable length of life of the individual, the cumulative effect of the specific mortality rates at different ages in respect of the two sexes: the higher the specific death rates in a community the smaller will be the expectation of life.

4. The specially vulnerable groups in any community are children, particularly those in the first year of life, and old people. In addition, women at the reproductive ages are exposed to special risks during pregnancy and child-bearing, and maternal morbidity and mortality are factors which require special consideration in estimating the state of the public health.

The rates of mortality among infants and children and among mothers are examined below in greater detail.

Deaths among Infants and Children

5. Deaths among infants and among children under 10 years of age in British India and in England and Wales are shown below as percentages of the total deaths at all ages in the two countries.

Deaths at specific age-periods shown as percentages of the total deaths at all ages

—	Under one year	1-5 years	5-10 years	Total under 10 years
British India (average for 1935-39) . . .	24·3	18·6	5·5	48·4
England & Wales (1938)	6·8	2·1	1·1	10·0

It will be seen that, in India, nearly half the total deaths are among children under 10 years of age and that, of the mortality in this age group, one half takes place within the first year of life. The percentage for England and Wales in every age group shown above is very much smaller.

Maternal Mortality

6. The recorded rates for maternal mortality in the provinces vary considerably, ranging from such low figures as 0·06 per 1,000 births to about 12 per 1,000. These figures give an incorrect picture of the actual situation as revealed by special enquiries conducted in limited areas in different parts of the country. Taking into consideration the results of these enquiries, a special Committee appointed by the Central Advisory Board of Health to report on maternity and child welfare work in India came to the conclusion in 1938 that the rate for the country as a whole "is probably somewhere near 20 per 1,000 live births".

7. It has been estimated that, in British India, maternal deaths total annually about 200,000. With such a large mortality, the number of women suffering from varying degrees of disability and discomfort as a result of child-bearing must be very much larger, probably about four millions if estimates, made elsewhere, of the proportion of cases of mortality due to maternal causes to those of morbidity from the same causes can be taken as an approximate guide for India. It is clear that any plan for improving the health of the community must pay special attention to the development of measures for adequate health protection to mothers and children.

The Prevalence of Diseases

8. The average annual numbers of deaths in British India during 1932-41, from the epidemic diseases of cholera, smallpox and plague and from certain groups of causes, under which the remaining deaths are compiled, are shown below. The figures in brackets give the deaths under each head as percentages of the total number of deaths.

Average Annual Deaths in British India, during 1932-1941, excluding Burma

Cholera	Smallpox	Plague	Fevers	Dysentery and diarrhoea	Respiratory diseases	Other causes	Total
144,924 (2·4)	69,474 (1·1)	30,932 (0·5)	3,622,869 (58·4)	261,924 (4·2)	471,802 (7·6)	1,599,490 (25·8)	6,201,434 (100·0)

A striking feature of this table is that a number of diseases are grouped under such headings as 'fevers', 'respiratory diseases' and 'other causes'. The reason for this is that the organisation for reporting births, deaths and cases of infectious diseases is of a primitive type, particularly in the rural areas, where the greater part of the population lives. In these areas the village watchman is the reporting agent and the degree of accuracy regarding the cause of death is so low that only classification into such large groups such as 'fevers' and 'respiratory diseases' seems to be justified. The largest single cause of death under 'fevers' is undoubtedly malaria and, under 'respiratory diseases', tuberculosis. In the sections dealing with these diseases we have attempted to give as much information as is possible regarding their incidence but, in the absence of a well-developed health organisation over the country as a whole, and of a satisfactory agency for the registration of vital statistics, any estimates that are made in respect of these and other diseases must necessarily be conjectural. As regards cholera, smallpox and plague the people are familiar with their symptoms and, although no completeness of registration can be claimed, the recorded figures give a clearer indication of their incidence than in respect of most other diseases. These three (cholera, smallpox and plague) together contributed only 4·0 per cent. of the total mortality during the period 1932-41. Thus, compared with malaria and tuberculosis, the total extent of suffering, incapacitation and death caused by them appears to be definitely smaller. Nevertheless, it must be remembered that a disease like smallpox is perhaps more easily prevented than most other infectious diseases and should have been prevented long ago. India continues to be the largest reservoir of smallpox infection, although vaccination against it was the first preventive measure introduced into the country and has been practised on a large scale for the past

seventy or eighty years. The reasons for the failure to eliminate the disease or to reduce its incidence to negligible proportions are many, but their detailed consideration in this brief review of existing conditions does not seem justified and has, therefore, been postponed to that portion of the report which deals with smallpox.

9. Endemic diseases such as leprosy, filariasis, guineaworm infection and hookworm disease are responsible for a considerable amount of morbidity in the country, although their contribution towards mortality is relatively small. Special investigations carried out in different parts of the country have thrown light on the extent of incidence of these diseases. Such information as is available will be given in the chapter dealing with the history of the chief diseases.

10. To sum up, the present low state of the public health in India is reflected in the wide prevalance of disease and the consequent high rates of mortality in the community as a whole and, in particular, among such vulnerable groups as children and women in the reproductive age period. It is considered that at least 50 per cent. of the existing mortality in the country is preventible and should therefore be prevented.

CAUSES OF THE LOW LEVEL OF HEALTH IN INDIA

11. The maintenance of the public health requires the fulfilment of certain fundamental conditions, which include the provision of an environment conducive to healthful living, adequate nutrition, the availability of health protection, preventive and curative, to all members of the community irrespective of their ability to pay for it and the active co-operation of the people in the maintenance of their own health. The large amount of preventible suffering and mortality to which reference has already been made is mainly the result of an inadequacy of provision in respect of these fundamental factors. Environmental sanitation is at a low level in most parts of the country, mal-nutrition and under-nutrition reduce the vitality and power to resistence of an appreciable section of the population and the existing health services are altogether inadequate to meet the needs of the people, while lack of general education and health education add materially to the difficulty of overcoming the indifference with which the people tolerate the insanitary conditions around them and the large amount of sickness that prevails.

The causes responsible for the present low level of health are considered below in greater detail.

The Prevalence of Insanitary Conditions

12. The wide prevalence of insanitary conditions in rural and urban areas is so well known that it seems hardly necessary to provide any evidence in support of it. Existing provision for the disposal of nightsoil and rubbish and for protected water supply will be discussed in those sections of the report which deal with them, and we need not go into these details here. But, in order to give some idea of the conditions prevailing in the rural areas, we may quote the results of certain surveys of the villages in the Punjab carried out by the Public Health Department of that

Province. The Director of Public Health took the following as criteria for what he termed a " sanitated village " :—

1. a water supply protected from surface contamination;
2. drains for the removal of waste water;
3. regular removal of filth and refuse outside the village to a place prepared for their reception.

The Director of Public Health pointed out in his annual report for 1936 that, of a total of 35,871 villages in the province, only 382 villages distributed over 27 districts (or about 1 per cent.) satisfied these conditions and could be considered as " sanitated ". As the result of a continued drive to improve village sanitation, the number of " sanitated " villages rose to 5,470 by 1943 or 15·2 per cent. of the total. The criteria laid down can be considered as only minimum standards of environmental sanitation and, although some progress has been achieved in this province, much more remains to be done. Similar information is not available for other provinces but there is no reason to assume that the conditions in them are in any way better than in the Punjab. Indeed, it may well be that, in some, they are worse.

Nutrition

13. Defective nutrition may take two forms resulting either from an ill-balanced diet, which fails to provide the required constituents of food in their proper proportions, or from the energy value of the food being insufficient to provide for all the activities of the individual concerned; the former constitutes mal-nutrition and the latter under-nourishment. Many persons suffering from under-nourishment are also the subjects of mal-nutrition. Both these forms of defective nutrition impair the health and working capacity of human beings. Continued under-nourishment produces a state of semi-starvation. Dr. Aykroyd, the Director of the Nutrition Research Laboratories, Coonoor, has said that an insufficient and ill-balanced diet is typical of the food consumed by millions in India.

14. In India about 80 to 90 per cent. of the food consumed by the people consists of cereals. Such figures as are available suggest that the average annual production of cereals in the country in 1939-43 fell short of the necessary requirements of the population by about 22 per cent.* In regard to other articles of diet such as vegetables, fruits, milk, meat, fish and eggs the quantities now produced will have to be increased several times before adequate amounts will become available for the proper nutrition of the people. It will thus be seen that the diet of the population as a whole is seriously defective both in quality and quantity.

Inadequacy of the existing Medical and Preventive Health Organisations

15. This question may be considered from the point of view of the strength of health personnel, the number of medical institutions, the quality of service rendered by them and the bed strength available for the hospitalisation of patients.

* Report of the Food Grains Policy Committee, Government of India, (1943) quoted by the Report of the eleventh meeting of the Nutrition Advisory Committee of the Indian Research Fund Association March 1944).

16. Some idea of the magnitude of the task to be accomplished in increasing trained personnel of various types within the next 25 years may be obtained from the following figures:—

Class of personnel	Number available now	Ratio of numbers in column 2 to the present population of British India (300 millions)	Existing ratio in the United Kingdom	Suggested ratio to be attained in 1971 in British India with an estimated population of 370 millions	Number required in 1971
1	2	3	4	5	6
Doctors	47,400	1 to 6,300	1 to 1,000	1 to 2,000	185,000
Nurses	7,000	1 to 43,000	1 to 300	1 to 500	740,000
Health visitors	750	1 to 400,000	1 to 4,770*	1 to 5,000	74,000
Midwives	5,000	1 to 60,000	1 to 618†	1 to 4,000 (or 1 per 100 births)	92,500
‡Qualified Pharmacists.	75	1 to 4,000,000	1 pharmacist to 3 doctors	1 pharmacist to 3 doctors	62,000
Qualified Dentists	1,000	1 to 300,000	1 to 2,700	1 to 4,000	92,500

We have given existing standards in the United Kingdom but have suggested for India lower ratios as the targets to be aimed at during the next quarter of a century. The reason is that the available numbers in the various categories of personnel are so small that even the attainment of the suggested ratios by 1971 will involve concerted, intensive and unremitting effort, on an unprecedented scale, by the authorities concerned. The figures in column (2) are based on information obtained from the Provincial authorities and relate generally to 1942 or 1943. The population of British India on which the ratios in column (3) are based is estimated at 300 millions. The population in column (5) is estimated as 370 millions by the year 1971. The increase of population in British India between 1911 and 1941 was approximately 64 millions. Even if the rate of growth remains the same, the increase in a particular decade will be influenced by the size of the population at the beginning of that period, and the relatively large increase in India's population during 1921-41 may, therefore, be expected to make the absolute increase in the later decennium relatively higher. Nevertheless, it has been assumed that the probable increase during the next thirty years will not exceed 75 millions and the estimate for 1971 is therefore taken as 370 millions, as the enumerated population of British India in 1941 was about 295 millions.

17. Of the 47,400 doctors available in the country only about 13,000 are reported to be on the staff of medical institutions maintained by Governments and other agencies. The remaining

* Based on 1935 figure.

† Based on 1943 figure.

‡ Persons who have had training acceptable in countries where legislation controlling pharmacy exists.

medical men must therefore be in private practice. The tendency is for the latter to concentrate in urban areas. For instance, in Bengal, the ratio of doctors to the population is three and a half times more in urban than in rural areas. In Sind the proportion is much higher, the doctor to population ratio in urban centres being about 49 times that for the rural areas. When it is remembered that about 90 per cent. of the total population live in villages, the extent to which provision for skilled medical aid is lacking in the country as a whole becomes emphasised.

Before any reasonably rapid expansion of health services can be carried out, the available numbers of health personnel under the different categories will have to be increased considerably. The provision of facilities for training should, therefore, have the highest priority in the health programme we put forward.

18. The average population served in each province, during 1942 by one medical institution (hospitals and dispensaries considered together) is shown below:—

Province	Average population served by a medical institution in 1942		Province	Average population served by a medical institution in 1942	
	Rural	Urban		Rural	Urban
1. Sind* . .	22,904	7,630	7. Orissa . .	52,548	15,276
2. N.-W.F.P. .	34,053	9,359	8. Bombay .	34,927	17,127
3. Punjab . .	30,925	15,188	9. Bihar . .	62,744	18,630
4. Assam . .	44,562	172,962	10. C.P. & Berar	66,008	11,379
5. Bengal . .	37,996	19,730	11. U.P. . .	105,626	17,668
6. Madras . .	42,672	28,496			

While the extent of provision for medical relief in urban and rural areas varies considerably among the Provinces, the rural population has everywhere been less adequately provided for than the urban. The inhabitants of the rural areas live more widely dispersed than those of the urban and the medical aid given by an institution becomes to that extent more restricted. In the United Provinces there were 102,473 villages at the 1941 census and the average number of villages for a rural population of 105,626 shown in the table is 224. These figures should help to give some idea of the inadequacy of the existing provision of medical institutions.

19. Apart from the insufficient number of hospitals and dispensaries available for providing medical relief to the people, the quality of the service rendered by these institutions leaves much to be desired. During our tours in the provinces we noticed that, in most dispensaries and out-patient departments of hospitals, the time devoted to patients was so short as to make it perfectly obvious that no adequate medical service was given to the people. For instance, in one dispensary the average number of cases seen in an hour was 75. The time given to a patient, therefore, averaged 48 seconds. In another dispensary the time was about

* These figures relate to the year 1939.

a minute. The inadequacy of the number of doctors employed is, therefore, evident. In addition, the medical officers in charge of many dispensaries have, for long periods, been out of touch with modern medical practice without an opportunity to work in a well conducted hospital, such as the better class institutions located at the headquarters of districts. The quality of the medical aid given by such men must necessarily be low. Other defects include unsatisfactory conditions in regard to the design of, and accommodation in, medical institutions, considerable overcrowding in the wards and grave insufficiency of the nursing staff.

20. We also desire to draw attention to the grave difficulties to which the poorer classes are put in securing medical aid at public hospitals and dispensaries. They frequently come from considerable distances and may have to spend a whole morning before they are seen by the doctor. The sympathetic attention and courtesy which they are entitled to expect from the hospital staff are often absent. We recognise that the great insufficiency of existing staff may, in part, explain this, but we feel bound to draw the attention of the authorities concerned to these defects in the administration of medical institutions in the interests of ensuring a better standard of service to the people. All the steps that are necessary to remove these defects should be taken without delay. Apart from the fact that the poorer sections of the community have the right to demand fair treatment at the hands of the hospital staff, we feel that the one condition which we have stressed for ensuring the success of the future health programme, namely, the active support and co-operation of the people in the day-to-day functioning of the organisation, cannot be fulfilled without a radical change in the existing state of affairs.

21. The number of beds available in British India, including those for the treatment of general and special diseases, is about 73,000 or about 1 bed to 4,000 of the population. The following figures compare British India with England and Wales and the United States of America in this respect:—

U.S.A.	10·48	beds per	1,000	population.
England and Wales . .	7·14	,, ,,	1,000	,,
British India . . .	0·24	,, ,,	1,000	,,

22. The question may be considered from another point of view. In England it has been estimated that, with the existing morbidity and mortality rates, the minimum standards should be 10 beds per 1,000 of the population. On this basis the number of beds required for India will be over 40 times the present provision. When it is remembered that the mortality rate in England is only half that of India and that the morbidity rate in the latter is, therefore, bound to be much higher than in England, adequate institutional care would seem to require an expansion of hospital accommodation which may well be about 80 or 90 times the present provision.

23. Some idea of what can be achieved in increasing hospital accommodation can be obtained from what has been done in Soviet Russia within a period of about a quarter of a century. In 1914

the number of beds per 1,000 of population was 0·98. By 1940 it had risen to 4·66, an increase by over four and a half times.

24. As regards the preventive health organisation, a certain number of provinces have District Health Officers in charge of rural health administration in all their districts, some others have such officers only in a limited number of districts, while the remaining provinces have the Civil Surgeon in combined charge of medical and public health activities. The extent to which health officers have been appointed in municipalities also varies widely in the provinces. The total number of sanitary or health inspectors employed in British India is about 3,000 while it has been estimated that the number required will be in the neighbourhood of 12,000. The existing number of midwives is probably 5,000, while, for adequate service to the people, 100,000 are considered necessary. The total number of health visitors in the country is about 700 or 750 while, for the supervision of the work of 100,000 midwives about 20,000 health visitors will be required. The number of woman doctors with special training in maternity and child welfare work is about 70 or 80 and, of these, only a dozen are women graduates in medicine with adequate special training in maternity and child welfare work.

25. Thus it will be seen that the existing organisations for curative and preventive health work in India are altogether inadequate for the tasks with which they are confronted. On the medical side, the existing staffs are hardly able to do anything more than struggle with the large numbers of patients crowding into hospitals and dispensaries. On the public health side, the energies of the skeleton staff employed in the provinces have, so far, been concerned mainly with measures for the control of epidemic diseases, and even this task is being performed with insufficient results. A wide expansion of the curative and preventive health services should therefore form an important part of our programme of future health development in the country.

General Education and Health Education

26. The purpose that general education has in view is to develop the individual into a useful citizen; the purpose of health education is to inculcate the principles of healthful living in order to secure the full co-operation of the individual in the maintenance of his own health. Without general education the task of imparting instruction in health matters becomes difficult. Apart from the handicap that illiteracy places on health education by restricting the methods of appeal to the spoken word or to visual demonstration, education in its wider sense is essential in order to promote a general raising of the standard of culture in the community and to quicken the sense of civic responsibility of the individual. The insanitary conditions associated with rural and urban life in the country can, to a large extent, be mitigated if the individual feels a sense of responsibility towards his neighbour. Speaking generally, while the Indian home is kept fairly clean, the sense of responsibility of the average person in regard to

community hygiene seems not infrequently to be conspicuous by its absence. It is clear that the development of civic consciousness is essential if an improvement of environmental hygiene is to be effected. The importance of general education and health education for creating this civic consciousness cannot be over-emphasised.

27. The percentage of literate persons in British India at the 1941 census was only 12·5. Apart from this low figure, the quality of general education now imparted in primary schools is of a very low standard and a large proportion of the persons, whose educational career terminates at the primary school stage, lapses into illiteracy.

28. As regards health education, the low standards of personal and environmental hygiene met with among large sections of the people in urban and rural areas indicate that the measures so far taken to educate them in the hygienic mode of life will have to be strengthened considerably if their co-operation is to be secured for the maintenance of their own health and for keeping up a high standard of community hygiene.

The Social Background of Ill-health

29. In addition to the causes for the low level of health discussed in the preceding paragraphs mention should be made of certain social factors which are also important in this connection. These include unemployment and poverty and certain social customs such as the *purdah* and early marriage. Further, the people view with apathy the large amount of preventible sickness and mortality which exists in their midst and this outlook has no doubt been largely due to the continuance of the existing state of affairs through many generations, to which the inadequacy of the available health services has been an important contributory factor. Measures designed to change this outlook are essential, if a definite improvement in the public health is to be achieved.

30. Unemployment and poverty produce their adverse effect on health through the operation of such factors as inadequate nutrition, unsatisfactory housing and clothing and lack of proper medical care during periods of illness. While recognising that it is not within the scope of our enquiry to suggest ways and means by which poverty and unemployment should be eliminated, we feel that our survey of the causes of ill-health in India will not be complete without drawing attention to the profound influence that these factors exert on the health of the community. In a reaffirmation of the principles regarding health policy in connection with discussions on the Beveridge report, the British Medical Association emphasised that " the health of the people depends primarily upon the social and environmental conditions under which they live and work, upon security against fear and want, upon nutritional standards, upon educational facilities, and upon the facilities for exercise and leisure ".*

* British Medical Journal for 7th August 1943.

31. The effects of the *purdah* on the health of those who observe this custom are perhaps more marked in respect of tuberculosis than any other disease.* In a paper entitled " Tuberculosis in the Zenana "† dealing with this problem in Ludhiana, Dr. Rose A. Riste, Director of Tuberculosis and X-Ray Departments of the Women's Christian Medical College, Ludhiana, Punjab, has given evidence of the effect that this custom has on the incidence of the disease.

" The earlier seclusion, including the *burqa*, of the Mohammedan girl shows its effect in the earlier rise of her tuberculosis death rate, to 44·46 in the 10 to 14 age group as against her Hindu sister's, 18·81. Their brothers' rises were slight: to only 6·88 for the Mohammedan youth and to 12·70 for the Hindu. A few years later, during the universally critical period of childbearing, practically all members of these *purdah* families get the full effect of their seclusion, and their death ratio soars."

32. As regards early marriage no information is available from the 1941 census. At the 1931 census a rather unusual phenomenon was observed, namely, that the proportions of married males and females under 15 years of age, which had steadily decreased at each successive census after 1881, suddenly showed increases in 1931. The relevant figures are quoted from the Census of India, Volume I, Part I, 1931.

Number of married per 1,000 of those aged 0-15 years

Sex	1881	1891	1901	1911	1921	1931
Males	63	59	59	54	51	77
Females	187	170	162	156	144	181

This sudden rise was stated by Dr. Hutton, the Census Commissioner, to have been " due to the enormous number of infant marriages which took place in the six months' interval between the passing of the Sarda Act and its coming into operation ". He also stated, that, in many cases, " the children married in all

* In our opinion the views expressed about the effects of *purdah* on the health of those who observe this custom are erroneous and based upon insufficient information of the practice of *purdah*. To our knowledge no scientific investigation has so far been carried out anywhere in India to evaluate the effects of *purdah* alone on health generally and rate of incidence of tuberculosis particularly.

The extract quoted from the report of Dr. Riste seems to us to be based upon entirely insufficient data, as we feel that there are several very important factors which may be responsible for the rise in the incidence of tuberculosis in that particular age group of Muslim girls as against their Hindu sisters of the same age group, which do not seem to have been taken into account.

A. H. Butt.
Khadija Shuffi Tyabji.
M. A. Hameed.

† Indian Medical Gazette, September 1938.

this haste were the merest infants". The Sarda Act came into force on 1st April 1930 and it made the minimum age for marriage for girls 14 years, which is too low for placing the strain of maternity on a growing girl. A social custom which impelled the people to marry even infants in anticipation of legal prohibition dies hard and, although no later information is available regarding the age distribution of married women, it may not be unreasonable to assume that child marriages in close proximity to the permissible age of 14 must still be common in the country. The ill-effects of child marriage on the mother's health are indicated in the following figures for maternal mortality quoted from a report on an investigation into the subject carried out about 17 years ago in Madras Presidency by the Provincial Public Health Department.

* Age period	Maternal death rate per 1,000 confinements.
Under 15	46·51
15 to 19	23·74
20 to 24	17·91

33. The higher risk of maternal mortality at the lower age periods is clear. Death is often only the final release from a period of suffering and incapacitation. The higher death rate for girl mothers is bound to be accompanied by a larger proportion of cases suffering from varying degrees of discomfort and disablement in comparison with child-bearing women at later ages.

34. No measures designed to improve existing conditions can produce lasting success unless the people are aroused from their apathy to tolerate the insanitary conditions around them and the large amount of sickness that prevails, can be overcome. Towards this end it is desirable that the people should be associated with the measures that are undertaken for the improvement of their health. A spirit of self-help should be created among the people through the development of co-operative effort for the purpose of promoting curative and preventive health work. In the programme of health development, which we put forward, the need for securing the active co-operation of the people in the day to day functioning of the health organisation should be prominently kept in view.

35. To sum up, the factors responsible for the low level of ill-health in India include, among others, the prevalence of malnutrition and under-nutrition among appreciable sections of the people, the serious inadequacy of existing provision for affording health protection to the community and a group of social causes consisting of poverty and unemployment, illiteracy and ignorance of the hygienic mode of life and certain customs such as the *purdah* and early marriage. The cumulative effect of these factors

* Quoted from the "Report on an Investigation into the causes of Maternal Mortality in the City of Madras" by Dr. (now Sir) A. Lakshmanaswamy Mudaliar.

is seen in the incidence of a large amount of preventible morbidity and mortality in the community. The continued prevalence of such conditions for many generations has probably helped to create in the minds of the people an attitude of passive acceptance of the existing state of affairs. This attitude will have to be overcome and their active co-operation enlisted in the campaign against disease, insanitation and undesirable personal and community habits, if any lasting improvement in the public health is to be achieved.

CHAPTER II.

HISTORY OF HEALTH ADMINISTRATION IN INDIA

Administrative Organisations at the Centre, at the Headquarters of Provincial Governments and in Local Areas and their inter-relationships

Introduction

1. The early efforts of health administrations were directed to the alleviation of suffering and to the rehabilitation of the sick. The idea of prevention came later, partly as the result of the observation that diseases were often communicated from the patient to those in close association with him. Thus arose the conception of segregation of the sick and of the enforcement of quarantine against those who were in contact with patients. These measures were carried out in Europe and Asia against diseases such as plague and leprosy many centuries before the causes for their incidence had become known.

2. In the early days, the enforcement of such preventive measures was sought to be achieved mainly by incorporating these practices in the life of the community and by strengthening their observance through the compelling force of religious sanction. The provision of medical aid to the people developed mainly as a doctor-patient relationship, without an attempt to organise the service on the basis of meeting the requirements of the community as a whole. Religious organisations had frequently a prominent part to play in the establishment of such treatment facilities and the range of ministration was generally restricted to limited sections of the population. The modern conception of a simultaneous application of preventive and remedial measures to maintain the health of the individual and of the community was absent in those days. Nor was there an adequate recognition of the role that environmental hygiene plays in the preservation of health. The reasons for these are not far to seek. It was the development of modern sciences, such as bacteriology, parasitology and pathology, in the latter half of the last century which brought to the forefront the importance of specific organisms as the causative agents for individual diseases and indicated clearly the particular modes of spread of these diseases. The gradual evolution of rational methods for their control was a natural sequel to the development of such knowledge. The recognition that patients were active disseminators of infection has led to the acceptance of the need for their segregation and treatment. The prevention of the spread of infection from the patient to those who are healthy requires, in many cases, active interference by man with the natural environment, in order to control the multiplication of insect and other carriers of infection or to remedy the harmful effects of contamination of air, water and food by material likely to cause disease, whether it be derived from human or other sources. It has thus become recognised that the coordinated application of curative and preventive measures can alone help to secure an adequate control over the incidence of disease. This remark applies not only to conditions of ill-health in which invasion by an outside organism is the main causative factor but also to those diseases, such as diabetes or gout, where a derangement of the normal functioning of the body is the principal cause. In such cases a change in the previous mode of

life of the patient is essential and preventive health work now includes, in addition to environmental hygiene on the lines already indicated, education of the patient to the adoption of the desired changes in his habits. This comprehensive conception of what a community health service should undertake has led to the development of modern health administration, in which the State makes itself responsible for the establishment and maintenance of the different organisations required for providing the community with health protection on the wide basis indicated above. It is clearly beyond the capacity of individuals or of groups to secure for themselves these facilities from their own resources. Moreover, the enforcement of many of these measures requires legal sanction and governments are alone in a position to arm themselves with the necessary legal powers.

3. It will thus be seen that the active promotion of the public health is a comparatively modern conception. We believe that Great Britain led the way in the development of health administration, both in its legislative and administrative aspects. It is less than one hundred years since, in that country, legislation towards the control and improvement of the health of the individual and the community acquired, in the words of the great exponent of Preventive Medicine Dr. (later Sir) John Simon, " the virtue of the imperative mood ". In that country and in the West generally the latter half of the nineteenth century saw, as has already been pointed out, a growth in knowledge in all branches of medical science far beyond anything that had occurred in the previous centuries. The assimilation and application of this knowledge even in Europe were a gradual process. In India the rate of progress in health administration has been much slower. We shall describe briefly below the successive stages of its development. Before doing so, reference may be made to one aspect of health administration in which India differs from other countries. In the latter the provision of medical relief for the community has largely developed in the past through the efforts of voluntary agencies and through the growth of an independent medical profession. In India, on the other hand, medical relief was accepted by the State as its responsibility from the beginning. Indeed, it received much more attention than the development of those preventive health measures which may collectively be termed " public health activities ". In the paragraphs that follow we shall confine attention to the development of public health administration as apart from medical administration.

The Development of Public Health Administration in India

4. We may refer to four landmarks in the history of public health administration in the country. These are:

(1) the appointment of a Royal Commission to enquire into the health of the army in India in 1859;
(2) the report of the Plague Commission in 1904 following the outbreak of plague in 1896;
(3) the Reforms introduced by the Government of India Act of 1919 and
(4) the Reforms introduced by the Government of India Act of 1935.

5. The Royal Commission of 1859, which was appointed to enquire into the conditions of health of the army in India recommended measures not only for the army but also for the civil population. In accordance with its suggestions " Commissions of Public Health " were established in the provinces of Madras, Bombay and Bengal in 1864. The Commissions in Madras and Bengal put forward far-reaching recommendations, which included the employment of trained public health staffs in towns and in districts. But these recommendations were not carried out and no comprehensive policy in regard to the development of preventive health services was laid down. Certain administrative posts were, however, created at the Centre and in the Provinces. The officers concerned were designated Sanitary Commissioners. In addition to advising Governments and local bodies on sanitary matters these officers were entrusted with the control of vaccination against smallpox in their respective areas. In 1888, in view of the recent creation of local bodies, municipal and rural, the Government of India " issued a resolution drawing the attention of local bodies and village unions to their duties in the matter of sanitation ". The success achieved by such efforts was, however, negligible except in the larger cities. Each provincial Sanitary Commissioner had only one assistant to work with him and, apart from this lack of adequate technical staff, the main emphasis continued to be laid, during the period, on the development of medical relief. Medical administrators did not give preventive medicine its proper place. We recognise that, for this, there was some excuse. The vast numbers of India's sick presented a field so obviously demanding attention that it was to the practice of curative medicine that, by far, the majority of the doctors in the State health service turned. Lay administrators, therefore, naturally tended to regard provision for hospital facilities and attention to the sick as of more importance than arrangements to meet the fundamental requirements of the community and the individual in regard to environmental hygiene. Without these requirements being met, the attempt to cure the sick of a continent, though embarked upon courageously, was doomed to failure.

The Outbreak of Plague in India in 1896 and the Report of the Plague Commission in 1904

6. The outbreak of plague in India in 1896 had a great effect on the people and on Government. We may quote in this connection the remarks of a former Sanitary Commissioner with the Government of India:—

" When plague appeared it was not a new disease to India, but it was new to the present generation of Indians and it has exacted a very heavy toll of deaths all over the country. The strangeness of the disease, the unpopularity of the measures taken to control it and impotence of these measures, have served to rouse the people from their apathy and concentrate the attention of all, but especially of the educated classes, on sanitation in a way that nothing else could have done. The more enlightened have begun to grasp the fact that much of the present sickness is preventable

and much of the mortality unnecessary, to realise in short the importance of sanitation, the economic value of health and the wastefulness of sickness and premature death. This is shown by their demand for better water, better food, better housing, better drainage. The movement once started will certainly increase and gather force..... At the same time plague has not been without its effect on Government. Previous to the advent of this disease it had been the generally accepted opinion that sanitation was the work of any medical officer and required no special training. A special sanitary staff had therefore not been considered of any very great importance. When plague appeared the staff was inadequate and unprepared; action was taken on general principles and sanitary measures were adopted, which, with further study of the etiology, we now know, were unsuitable and could do little to check the spread of the disease. The waste of life, time, money and effort that resulted has impressed on Government the necessity of being prepared in future."

7. The report of the Plague Commission in 1904 recommended the strengthening of the public health services and the establishment of laboratories for research and for the preparation of vaccines and sera. The action taken to implement those recommendations included the creation of a Medical Research Department under the Central Government, the establishment of the Indian Research Fund Association for promoting research into medical problems and annual grants from the central funds to the provinces to assist in the execution of public health works, such as drainage and water supply, and in the strengthening of public health personnel by additions to the existing posts of Deputy Sanitary Commissioners under Provincial Governments and of health officers under local bodies. But the total effect of such measures on the health problems of a sub-continent like India was necessarily small. Attention was directed mainly to urban centres while about 90 per cent. of the country's population lived widely dispersed in villages. Unless the preventive health organisation could be brought as close to this large section of the community as possible, there was little chance of any appreciable reduction in the incidence of preventable morbidity and mortality.

The Reforms introduced by the Government of India Act of 1919

8. As far back as 1914 the Government of India stated that its policy was to keep the control of research under itself but to decentralise other branches of health administration by transferring them to Provincial Governments. The Government of India Act of 1919 gave statutory sanction to this transfer of functions. Medical administration, including hospitals, dispensaries and asylums and provision for medical education, public health and sanitation and vital statistics, with certain reservations in respect of legislation by the Indian Legislature, were transferred to the provinces. In addition, in the provinces Ministers responsible to the legislature were entrusted with the administration of such departments as health, education, agriculture and cooperation. The results of these changes were of a marked character. The

Ministers were anxious to promote the growth of education, medical relief and preventive health measures as far as funds permitted. The establishment of trained public health staffs for rural and urban areas which the "Commissions of Public Health" had recommended in the sixties of the last century was taken up in earnest and, after the introduction of the Reforms of the 1919 Government of India Act, the organisation of such services was a marked feature in a number of provinces. Indeed, there has been, since that time, far greater public health activity in the provinces than ever before.

9. The administrative changes brought about in the provinces by the 1919 Act were also accompanied by certain detrimental effects. These are mainly in the field of local body health administration and we shall deal with them in the section relating to that subject.

10. The health functions of the Centre became reduced, under the Act, mainly to India's international health obligations, including port quarantine and marine hospitals, the census and legislation in respect of certain subjects such as the interprovincial spread of infectious disease.

The Reforms introduced by the 1935 Government of India Act

11. Under this Act the distribution of health functions between the Centre and the Provinces has remained practically unaltered. At the same time, a larger measure of autonomy has been granted to the Provinces than in the Government of India Act of 1919, with the result that the Provincial Legislatures and Provincial Governments are unfettered in the development of internal health policy and its implementation. It is against this background of an existing demarcation of health functions between the Centre and the Provinces that we shall have to consider our proposals for the development of health administration in India.

12. Under this Government of India Act there are three lists of subjects for legislation, (1) the Federal Legislative List, (2) the Provincial Legislative List and (3) the Concurrent Legislative List. The subjects included in the first and second lists conform broadly to the division of functions between the Centre and the Provinces, which we have briefly indicated above. The Concurrent List consists of two parts. Part I includes such subjects as the medical profession, lunacy and mental deficiency, and poisons and dangerous drugs. Part II includes factories, the welfare of labour, and prevention of the extension of infectious and contagious diseases from one unit of the Federation to another. In regard to the subjects under the Federal and Provincial Lists, the executive power is vested in the Central and Provincial Governments respectively. In respect of those under the Concurrent List, the executive power is vested in the Provincial Government. For the subjects under Part II of this list, the Central Government will, however, have the power of giving directions to the provinces if the necessary provision for this purpose is made in the Central Act dealing with any of these subjects.

Health Administration at the Centre

13. Until quite recently, the Central Government used to exercise its main health functions, so far as the civil population is concerned, through the Department of Education, Health and Lands. On 1st September 1945 a separate Health Department was constituted, thus fulfilling partially a recommendation which we have made in this report. We understand that, while a separate secretariat is now in charge of health matters, the Minister responsible for the portfolio of health has also other subjects to deal with. We have recommended that there should be a Minister who can devote undivided attention to health administration alone.

14. Certain other departments of the Government of India are also concerned with health functions in specific fields, in pursuance of the responsibilities of the Centre under the Federal and Concurrent Lists. For instance, the Labour Department deals with factories and the welfare of labour, the Finance Department with dangerous drugs and opium, the Home Department with lunacy and mental deficiency and poisons, and the Defence Department with the health administration of cantonments. Further, the Railway Board is concerned with the health of railway employees.

15. We shall now indicate, in some detail, the functions of the Central Health Department. These include the following subjects in the Federal and Concurrent Legislative Lists:—

(1) federal agencies and institutes for research, for professional or technical training or for the promotion of special studies where the research, training or special studies are related to medicine or public health;

(2) port quarantine; seamen's and marine hospitals and hospitals connected with port quarantine;

(3) the medical profession and other professions whose activities are related to medical relief and public health, *e.g.*, the nursing profession, the pharmaceutical profession, the profession of dentistry and

(4) the prevention of the extension from one unit to another of infectious or contagious diseases.

16. This Department also deals with those subjects in the Provincial Legislative List which are shown below, in so far as the Centre may be concerned:—

(1) public health and sanitation; hospitals and dispensaries; registration of births and deaths;

(2) local government;

(3) education, medical and public health;

(4) supply and distribution of cinchona and quinine;

(5) adulteration of foodstuffs and drugs and

(6) scientific societies concerned with medicine and public health.

The Technical Health Organisation at the Centre

17. On the technical side the Member in charge of the Health Department has two advisers, the Director General, Indian Medical Service, and the Public Health Commissioner with the Government of India.

18. The Director General, Indian Medical Service, advises the Government of India on all questions of a medical nature. He, as head of the Indian Medical Service, is responsible to see that that Service is kept up to its strength. He advises Government on the promotion of officers to the administrative posts. In peace time his technical staff consists of two assistants, a Deputy Director General, Indian Medical Service, who is responsible to the Director General for the administration of the office establishment and an Assistant Director General, who is in administrative control, under the Director General, of the civil medical stores depots. The Public Health Commissioner with the Government of India acts, in addition to his main duties, as Staff Officer on public health matters to the Director General, Indian Medical Service.

19. The Public Health Commissioner is the adviser to the Government of India on all public health matters including those relating to India's international health obligations and the medical aspects of overseas pilgrim and emigration traffic, and he is responsible to that Government for health administration at air and sea ports. He is also responsible for the consolidation and issue of vital statistical returns for British India as a whole and for an annual report to the Government of India on the health of the country. He used to be normally the representative of the Government of India on the Office Internationale d'Hygiene Publique in Paris and on the Health Committee of the League of Nations in Geneva. He has ordinarily two technical assistants, a Deputy Public Health Commissioner and an Assistant Public Health Commissioner.

20. Both the Director General and the Public Health Commissioner are closely associated with the promotion of medical research in India. The former is the administrative head of the Medical Research Department maintained by the Government of India, while the latter is mainly responsible for its actual administration under the control of the Director General. In the Indian Research Fund Association, which is the largest body concerned with the promotion of medical research in India, both hold important positions. They are members of the Governing Body of the Association. The Director General is the Chairman of the Scientific Advisory Board of the Association, which controls the scientific aspects of research and recommends the sanctioning of grants for specific enquiries. The Public Health Commissioner is the Secretary of the Association and of its Governing Body as well as of the Scientific Advisory Board. He is also in charge of the day to day administration of the Association.

21. In addition to these duties, the two officers participate in the health activities of a number of voluntary organisations, either as chairmen or as members. These organisations include the Indian

Red Cross Society, the Tuberculosis Association of India and the Indian Councils of the St. John's Ambulance Association and the British Empire Leprosy Relief Association. In addition, these officers are also members of certain committees concerned with the direction of special fields of health activity such as the Central Committee of the Pasteur Institute of India, the Governing Body of the School of Tropical Medicine, Calcutta, and the Countess of Dufferin Fund. Either one or both of them are on all these Committees. It will thus be seen that, apart from the technical advice they place at the disposal of the Central Government and of the Provincial Governments, if so desired by the latter, they are able to assist in promoting the activities of a number of organisations. The first four voluntary organisations are engaged in advancing their specific forms of health work on an all-India basis through a number of branches in the Provinces and States.

The Need for Coordination of Central and Provincial Health Activities and the Establishment of the Central Advisory Board of Health

22. As has already been stated, the provinces are autonomous in regard to all matters relating to internal health policy and administration. This position has been in existence, to a large extent, since 1921 when the Government of India Act of 1919 was brought into operation. Since that time the importance of providing machinery for coordinating the health activities of the Centre and the Provinces became increasingly evident as the years elapsed. In the circumstances, when the Government of India Act of 1935 was brought into force in April 1937, the Government of India decided that the time had arrived to establish an organisation for bringing together the Centre and the Provinces on a common platform to discuss health matters. It was also recognised that such discussions should bring, within their scope, the Indian States, because the contiguity of their territories with British India created common problems and interests in health matters. In June 1937 the Government of India established the Central Advisory Board of Health for this purpose under the chairmanship of the Member in charge of Health in the Viceroy's Executive Council and with members consisting of the Health Ministers in the provinces and of representatives from a certain number of Indian States (at first three States, later increased to four). In addition to the Member in charge at the Centre, the representatives of the Government of India include the Director General, Indian Medical Service, the Public Health Commissioner and representatives of the Defence and Railway Departments, because the health problems of the civil population are often closely associated with those with which these departments are concerned. A woman member is also generally nominated by the Government of India. The Board has so far held five meetings at intervals of about 18 months. Various matters of common concern in regard to health administration were discussed at these meetings and decisions (practically unanimous on all occasions) were reached. In addition, the Board has made definite contributions to the study of specific health problems through the reports of the special committees appointed by it to

investigate such problems. While, therefore, a certain amount of valuable work has been done, the recommendations made by the Board have, unfortunately, been carried out only to a very limited extent. For this the adverse conditions arising out of the war are partly responsible. But we believe that there is another reason also. Health planning and its execution must, in our view, be a continuous process and, in this process, the nature and range of cooperation between the Centre and the Provinces will have to be something more than the exchange of views which the meetings of the Board have so far provided. If our proposals for health development in the country are to be successfully implemented, active cooperation and assistance must take the place of academic discussions at such meetings. While we must defer, to the next volume of our report, a discussion of the measures which we consider necessary to develop and maintain such cooperation, we may mention here our view that the Centre will have to assist the Provinces with financial aid and technical advice in regard to their health schemes, if any reasonably rapid advance is to be effected. We mention this only to point out that the provision of suitable technical advice by the Centre will necessitate the employment of a much larger staff than the meagre establishments that now exist in the offices of the Director General and Public Health Commissioner. Health administration has, indeed, become so ramified as the result of developments in various fields that adequate technical competence in specific spheres of activity can be attained only by prolonged specialisation.

Central Health Legislation

23. Legal provisions regarding health matters are scattered over some 40 and odd enactments dealing with diverse subjects. Examples are the Quarantine Act, 1825, the Indian Merchants' Shipping Act, 1859, the Indian Penal Code, 1860, the Vaccination Act, 1880, the Medical Act, 1886, the Indian Railways Act, 1890, the Births, Deaths and Marriages Registration Act, 1896, the Epidemic Diseases Act, 1897, the Code of Criminal Procedure, 1898, the Glanders and Farcy Act, 1899, the Indian Factories Act, 1911, the Indian Steam Vessels Act, 1917, the Indian Red Cross Act, 1922, the Indian Mines Act, 1923 and the Cantonments Act, 1924. These legal provisions were made on different occasions to meet varying requirements and their administration is often in the hands of different authorities. A programme of future health development should take into consideration the need for, and the possibility of, bringing together as many of the health functions as possible under a unified authority such as a Ministry of Health and of so relating the exercise of health duties still left for administration by other authorities, to the general health administration of the country as to permit of the enforcement of desirable minimum standards of performance in the different spheres of activity and of the pooling of all available resources in personnel and material. For instance, in any area, a coordinated programme of development of the health services for the general population, industrial workers, prisoners and railway employees can avoid

unnecessary waste of public funds through the duplication of institutions, personnel and equipment in many directions and such a programme will also probably promote efficiency. To serve these purposes it may be necessary to enact a comprehensive Public Health Act. Existing health legislation in various enactments can be included in such an Act and, where necessary, amendments and additions can be incorporated in order to meet the growing needs of modern health administration.

The Centrally Administered Areas

24. Delhi Province, Coorg, Ajmer-Merwara and Baluchistan are under the control of the Central Government and are known as Centrally Administered Areas. The health administration of these areas, more particularly of the last three, generally leaves much to be desired. Mention should be made of the serious attempt made to control malaria in the Delhi urban area with a large measure of success.

Health Administration in a Province

25. Provincial health administration is, under normal conditions, in charge of a Minister responsible to the Legislature. As in the case of the Centre this Minister has generally charge of the administraton of a number of other departments also. He has two technical advisers who are responsible, subject to his control, for the administration of the Medical and Public Health Departments respectively. In the three provinces of Madras, Bombay and Bengal the former is called the Surgeon General and in most of the other provinces, the Inspector General of Civil Hospitals. The Officer in charge of the Public Health Department is known as the Director of Public Health. In the North-West Frontier Province these posts are combined while, in each of the two most recently created provinces of Orissa and Sind, a single officer controls medical and public health activities for the general population as well as the health administration of jails. He is designated the Director of Health and Prison Services. In all the other provinces the health administration of jails is in the technical charge of a separate officer, the Inspector General of Prisons, who works under the provincial Minister in charge of prisons.

26. Under certain existing rules the post of the head of the civil medical service in the Governors' Provinces is reserved for a certain class of officers in the Indian Medical Service. The right of choosing the incumbent of this post rests with the Provincial Government, but the selection has to be made from a panel of names drawn up by the Central Government. As regards the Director of Public Health, the position is different and the Provincial Government may appoint, at its discretion, either an Indian Medical Service officer or an officer belonging to the Provincial Public Health Service.

27. Under the provisions of Section 246 of the Government of India Act, 1935, a certain number of posts in the provinces has been reserved by the Secretary of State for members of the Indian

Medical Service. It is understood that one of the reasons underlying such reservation is the acceptance, by the Secretary of State, of the principle that British officers in civil employment under the Crown should be ensured medical service by British medical personnel.

It may also be mentioned that a certain number of posts under the Central Government has also been reserved for the civil branch of the Indian Medical Service under section 246 of the Government of India Act, 1935.

28. While, in certain provinces, the preventive health service has undergone a considerable development during the past two decades, in others no such expansion has taken place. The latter, while they have a Director of Public Health and a few assistants to help him, have not yet organised health staffs for rural and urban areas in the districts. In these provinces, preventive health duties form part of the responsibility of the Civil Surgeon in each district. The duties of the latter in connection with medical administration as well as his professional work in the district headquarters hospital and his private practice generally take up so much time that the public health functions, which he is required to perform, remain largely undischarged. We shall content ourselves here with this brief reference to the differences between individual provinces in respect of the public health service and shall describe in a separate chapter, the existing organisations for preventive and curative health work in the provinces and the extent to which they are able to fulfil the tasks that are expected of them.

Provincial Health Legislation

29. In the provinces also, legal provision in regard to health matters lies scattered over a number of Acts, and there is therefore need for the enactment of consolidated Public Health Acts in the provinces also. At present there is only one province (Madras) which has a comprehensive Public Health Act satisfying reasonably the requirements of modern health administration.

The Relationship between the Curative and Preventive Departments of Health

30. We may at this stage digress to review briefly the relationship between the curative and preventive departments of health both at the Centre and in the Provinces.

31. At the Centre the Public Health Commissioner deals directly with the Government of India in matters relating to international health and he is responsible to that Government for sea and air port health administration. In these and in the collection and publication of epidemiological information from the provinces, he functions in an independent capacity and is not subject to the control of the Director General. On the other hand, he acts as a " staff officer in public health " to the Director General as regards the administration of the Medical Research Department and certain institutions maintained by the Central Government. Again, in respect of research, there is close relation between these officers, as the Director General is the Chairman and the Public

Health Commissioner the Secretary of the Scientific Advisory Board of the Indian Research Fund Association. At the Centre the position seems therefore to be that, while the Public Health Commissioner is independent of the Director General in respect of health matters generally, he is, in certain respects, subordinate to that officer. While there exists some difference between individual provinces in the relationship between the officers in charge of the two departments, the position is, broadly speaking, that the two departments function independently of each other. With the large expansion of the Public Health Department in a number of provinces after the introduction of the Reforms under the 1919 Government of India Act, the independent existence and separate functioning of the two departments have become well established in such provinces. Before the expansion took place the Civil Surgeon was in charge of both curative and preventive duties and, if there was a recognition of the need for developing public health work (as in the case of the province of Madras), the method adopted to deal with the extra work was to give the Civil Surgeon a Sanitary Assistant with the status of an Assistant Surgeon in the provincial medical service.

32. The separation of the two departments has, in our view, helped to secure greater attention and support for the relatively new and developing preventive health service. At the same time, with the lapse of years, the results of their working independently of each other and of the consequential incoordination of effort are becoming more and more evident. In many branches of health activity the curative and preventive aspects cannot be separated without lowering the efficiency of the service to the people. For instance, a maternity and child welfare organisation cannot be built up on satisfactory lines without including in it the service which health visitors and midwives give in the homes of the people as well as the facilities for diagnosis and treatment required in respect of many forms of maternal ill-health and for the institutional care of difficult cases of childbearing, which the medical department can provide. These remarks apply equally to the control of infectious diseases, including tuberculosis, leprosy and venereal diseases. Even in those provinces in which the preventive health service has been best developed, the existing organisations are so understaffed and so ill-equipped with institutional and other facilities that the service they are able to offer to the people is of a very low standard. If the two departments are to function separately an unnecessary duplication of institutions, personnel and equipment seems inevitable, if reasonable standards of service are to be attained. In putting forward our proposals for the country's future health service, the question will therefore have to be considered as to whether the two departments should continue to work separately or whether they should coalesce into a single organisation.

Health Administration in Local Areas

33. Local bodies are responsible for health administration in their respective territories. The legal provisions defining their duties and powers are incorporated in the Self-government Acts

which have brought them into existence. Large municipal corporations such as those of Calcutta, Bombay, Madras and Karachi have been constituted by special Acts. Other municipalities in the provinces, in which these cities are situated, and all municipalities in other provinces are governed by a single municipal Act in each province, passed by the Provincial Legislature concerned.

34. District Boards constitute the local authorities for the non-municipal areas in the districts. In some provinces, *e.g.*, the Punjab and Bombay, Local Boards, whose jurisdiction covers a limited part of the District Board area, also exist and these are subordinate to the District Boards. In addition, smaller units of local self-government, such as Village Panchayats exist in certain provinces and Union Boards in others. These are subject to the control of the District Board.

35. Broadly speaking, the powers conferred on these authorities in respect of health matters relate to general sanitation, control of infectious disease, regulation of housing construction, control of the purity of food and water supplies, abatement of nuisance and registration of vital statistics. The health duties and powers conferred on the different types of local bodies vary, however, to a considerable extent. Municipal authorities have generally larger powers than rural local bodies.

36. Speaking generally, all local bodies have the power to appoint and control their own establishments, including the health staff. In certain provinces, however, Provincial Governments have made themselves responsible for the maintenance of cadres of health officers for both urban and rural areas, *e.g.*, Madras and the United Provinces. In the Punjab provincialisation of the service of health officers has been carried out only in respect of the rural areas. In those provinces in which local bodies appoint their own health officers, control by the Provincial Government is ensured by the statutory requirement that the prior sanction of the latter should be obtained for their appointment or dismissal. Other members of the public health staff maintained by local bodies are generally appointed and controlled by the local authorities themselves.

37. The general level of efficiency of health administration by local bodies is low. Some of the causes which contribute to this state of affairs are:—

(1) the financial resources of these bodies are, in the majority of cases, insufficient to maintain adequate services staffed with well qualified personnel;

(2) the executive power is generally vested in an elected Chairman who often finds himself powerless to enforce the law against vested interests in the absence of a public opinion sufficiently strong to demand such enforcement in the interests of the community and

(3) the local health officer and the Provincial Director of Public Health can only give advice to the Chairman and cannot ensure that such advice will be carried out even where it is urgently required in the public interest, as in the case of measures to control epidemics.

38. It may be mentioned that legislative and administrative measures taken by the Government of Madras have helped to remedy such defects to a large extent in that province. For instance, the executive powers of the Chairmen of municipalities in the field of general administration have been transferred statutorily to Commissioners appointed and controlled by the Provincial Government. The executive powers relating to health administration have been transferred to the local health officer. The Director of Public Health has been empowered to make recommendations to local bodies regarding the measures he considers necessary to improve local health administration and, subject to the concurrence of the Provincial Government, he is entitled to enforce the execution of these recommendations by the local authorities concerned. As regards expenditure on local health administration, municipalities are required to set aside 30 per cent. and district boards 12½ per cent. of their respective annual revenues for this purpose.

39. The ultimate responsibility for the improvement of local health administration rests on the Provincial Government concerned, administration rests on the Provincial Government concerned, which has been given by the Provincial Legislature considerable powers of supervision and control over the administration of local bodies. It can also acquire any further powers that may be required. Madras has shown the way as to how, through combined legislative and administrative measures, a much needed improvement in this field of administration can be effected.

CHAPTER III.

MEDICAL RELIEF AND PREVENTIVE HEALTH WORK IN THE PROVINCES

1. Having considered briefly in the previous chapter the administrative organisations for medical relief and preventive health work in the provinces, we shall describe here, in some detail, the existing facilities in these two fields of health administration. We shall deal with medical relief first.

Medical Relief

2. In the three provinces of Madras, Bombay and Bengal the administrative officer in charge of the medical department is known as the Surgeon General, while in other provinces the corresponding officer is the Inspector General of Civil Hospitals. The officer responsible for medical administration in a district is the civil surgeon. He is in charge of the district headquarters hospital, is the inspecting officer for all other public hospitals and dispensaries in the district and is, in certain provinces, responsible for public health administration also. In addition many calls are made on his time by his having to serve on various committees, official and voluntary, which are interested in health problems. A district is divided into sub-divisions which are normally in the medical charge of an officer of the provincial medical service, who holds a medical degree. He administers the sub-divisional hospital and looks after dispensaries in his own area. The hospitals and dispensaries in a sub-division are usually under the control of Government or of local bodies. The medical officers in charge of these are generally provincial service men with the qualification of licentiates.

3. In order to indicate the extent of medical relief available to the people we propose to give a series of tabular statements in which are shown the number of registered medical practitioners and of medical institutions as well as the staff and bed strength of the latter in individual provinces. We shall first deal with registered practitioners in the provinces.

Medical Practitioners (1941-42)

Provinces	Doctors registered			Ratio of registered medical practitioners to population
	Graduates	Licentiates	Total	
Assam	194	1,165	1,359	1 to 7,509
Bengal	4,586	7,690	12,276	1 to 4,913
Bihar	991	2,262	3,253	1 to 11,171
Bombay	4,430	4,971	9,401	1 to 2,218
Central Provinces and Berar	279	874	1,153	1 to 14,582
Delhi	174	82	256	1 to 3,586
Madras	2,974	5,056	8,030	1 to 6,145
North-West Frontier Province	121	161	282	1 to 10,773
Orissa	129	535	664	1 to 13,145
Punjab	1,994	4,330	6,324	1 to 4,494
Sind	155	323	478	1 to 9,487
United Provinces	1,627	2,421	4,048	1 to 13,586
TOTAL	17,654	29,870	47,524	1 to 6,300

4. Taking the population of British India as 300 millions, the proportion of doctors to population (considering graduates and licentiates together) is approximately 1:6,300. In England and the United States of America the corresponding proportions are 1:1,000 and 1:750 respectively. We feel that, in comparing such ratios, great caution should be exercised because a number of factors must be taken into consideration in determining the optimum proportion of doctors to the population. Such factors include the incidence of morbidity in the community; the type of medical relief which the people desire, for instance, whether it should be a general practitioner service catering to their needs or a State organisation offering comprehensive diagnostic and treatment facilities to all; the nature of population distribution in the country, *viz.*, whether it be concentrated in a relatively small number of places or distributed widely over the country as a whole, and various other matters. A mechanical application of existing ratios in other countries to India is not therefore justified. Nevertheless, it seems fairly reasonable to conclude that the existing proportion in India, of doctors to population will have to be raised considerably if the standard of facilities for medical relief is to be made to approach the levels already attained in England and in the United States.

5. Turning to individual provinces the figures are not in themselves sufficient to show the true position with regard to the availability of medical attention. On the face of it one doctor to 2,218 persons in the province of Bombay may appear to be, by no means, an unreasonable figure. One to 4,494 in the Punjab or 1:4,913 in Bengal might be held to be, at any rate, better than 1:13,586 in the United Provinces and 1:14,582 in the Central Provinces and Berar. A correct picture of the situation will, however, be obtained only if the distribution of the available doctors in each province between rural and urban areas is also taken into consideration. The fact that the rural population is generally about eight or nine times as large as that of urban centres and that this population lives widely dispersed necessitates that the vast majority of the doctors should devote themselves to rural medical relief if the facilities available in both types of areas are to be reasonably similar. We have, unfortunately, been unable to obtain the necessary figures for every province in order to compare the distribution of doctors between rural and urban areas. In Bengal it is understood that the doctor to population ratio in urban centres is about three and a half times that in rural areas. In Sind the corresponding proportion between urban and rural areas is as high as 49:1. Taking these into consideration as well as the figures showing the distribution of medical officers working under official agencies in these two types of areas, we believe that it may not be far from the truth if the conclusion is reached that at least 70 or 75 per cent. of the total number of available doctors in the country must be practising in urban centres. If this estimate is even approximately correct, it will be seen that the medical care which the inhabitants of rural areas obtain from those who practise modern scientific medicine, is very much less than that which the urban population receives.

Medical Institutions

6. In the following table the number of medical institutions in individual provinces is shown in relation to their respective populations:—

Provinces	Hospitals and Dispensaries			Average urban population served by one medical institution	Average rural population served by one medical institution
	Urban	Rural	Total		
(1)	(2)	(3)	(4)	(5)	(6)
Assam	59	229	288	4,756	43,337
Bengal	304	1,511	1,815	19,730	37,996
Bihar	125	528	653	18,630	62,744
Bombay	316	442	758	17,127	34,927
Central Provinces and Berar	184	223	407	11,379	66,008
Delhi	21	13	34	33,128	17,096
Madras	276	972	1,248	28,496	42,672
North-West Frontier Province	59	123	182	9,359	34,053
Orissa	21	160	181	15,276	52,548
Punjab	287	778	1,065	15,188	30,925
Sind	73	154	227	12,215	23,658
United Provinces	388	456	844	17,668	105,626

In every province the population to be served by a single medical institution is definitely more in rural than in urban areas. Another striking feature of the table is the disparity between the provinces regarding the ratio of institution to population in respect of both rural and urban areas. The number of medical institutions at present available is, in every province, far too small to provide a reasonable standard of medical service to the people, particularly in the rural areas. The lowest provision for the rural population is in the United Provinces. The average number of villages to be served in this province by a medical institution is 224. It seems fairly certain that an appreciable proportion of those living in rural areas may, throughout their lives, receive no medical aid from either a hospital or a dispensary.

7. Apart from the actual number of institutions we shall now consider the bed accommodation available in them to serve the needs of the people.

Provinces	Total number of beds	Ratio of bed to population	No. of beds to 1,000 of the population
Assam	1,469	1 to 8,729	0·115
Bengal	10,905	1 to 5,530	0·181
Bihar	6,025	1 to 6,031	0·166
Bombay	7,979	1 to 2,613	0·383
Central Provinces and Berar	2,738	1 to 6,140	0·163
Delhi	1,382	1 to 664	1·506

Provinces	Total number of beds	Ratio of bed to population	No. of beds to 1,000 of the population
Madras	14,776	1 to 3,339	0·299
North-West Frontier Province	1,868	1 to 1,626	0·615
Orissa	1,386	1 to 6,298	0·159
Punjab	12,307	1 to 2,309	0·433
Sind	2,057	1 to 2,205	0·454
United Provinces	11,219	1 to 4,500	0·222

8. The above figures may be compared with the corresponding rates of bed strength in certain other countries, which are shown below:—

—	Ratio of beds per 1,000 of population	Remarks (year)
United States	10·48	(1942)
United Kingdom	7·14	(1933)
France	3·72	(1929)
Germany	8·32	(1927)
U. S. S. R	4·66	(1940)
British India	0·24	

9. Apart from the inadequacy of the existing number of medical institutions and of the inpatient accommodation they provide to serve the needs of the people, their construction and equipment leave much to be desired. This remark applies to even some of the larger hospitals situated in the district headquarters towns and cities in the provinces. Reviewing medical institutions in Madras, which are generally situated in spacious compounds and are by no means designed entirely unsatisfactory, we discovered that, in two out of the five teaching institutions which we visited, there was no provision on the premises for the disinfection of infective bedding and clothing. In the Stanley Hospital, the Women and Children's Hospital and the Government Ophthalmic Hospital in Madras City, the outpatients departments do not approach modern requirements of even non-teaching hospitals and, indeed, their reconstruction on an extensive scale will be required. The laboratories in these hospitals are only clinical side-rooms. The existing conditions at the Irwin hospital in Delhi also call for adverse

comment. The design of the whole hospital is such as to increase the difficulties of the auxiliary medical staff in carrying out their duties, while the outpatient department is quite inadequate to meet the needs of a modern hospital. The Hindu Rao hospital, Delhi, is hopelessly out of date and, in our opinion, is so unsuitable for a medical institution as to require its early replacement by a more satisfactory building. In Bengal we may cite a typical Sadar hospital at Faridpur. At the time of our inspection, this hospital was clean and seemed to be well run with the limited staff available; the buildings, however, were old and in need of considerable repair. There was great overcrowding in the wards, accommodation for stores was inadequate and the high pressure steriliser needed immediate repair. Laboratory arrangements were practically non-existent. At Dacca the general impression produced after a visit to the Mitford Hospital was that it was reasonably satisfactory. Accommodation in the nurses' quarters was, however, wholly inadequate. The kitchen attached to these quarters was dark, was situated only ten yards from the dysentery and cholera ward and was not fly-proof. The facilities in the outpatients department were insufficient for treatment and teaching purposes. At Hyderabad (Sind) we noted in the Civil Hospital that there were no quarters for the nurses. Further, the nursing staff employed was deplorably short, there being but one sister and three nurses for 150 beds. The Sukkur Civil Hospital was not built as a hospital, it having been intended originally for police lines, and both equipment and accommodation were quite unsatisfactory. We do not propose to continue the story. We hope we have said enough to indicate that considerable capital expenditure will be needed in the provinces to improve the existing hospitals in the larger towns and in the headquarters of districts.

10. We may now turn to the dispensary, which should play an important part in the provision of medical relief to the rural population. Rural dispensaries too are, in many cases, functioning quite unsatisfactorily. The buildings, in which they are housed, are often inadequate to serve the purpose for which they are intended and their staff and equipment are also unsatisfactory. A single doctor, struggling with the help of a compounder, to deal with some hundreds of patients faces an almost impossible task. We noted, during our tours in the provinces, that the average time devoted to a dispensary patient may be as short as three-quarters to one minute. In such circumstances any reasonably correct diagnosis of the patient's condition would appear to be impossible. In most cases the supply of drugs and dressings is quite insufficient to meet the needs of the patients. Arrangements for patients to wait for their turn for examination require radical improvement, particularly in the case of women and children. The fact that the medical officers in charge of many of these dispensaries are often out of touch with modern medical practice, because they have had no opportunity of working in a well-conducted hospital for many years, also helps to render the medical aid given by them to be of a low standard.

Nursing Staff

11. The position regarding the nursing staff is even worse. The number of nurses employed in public medical institutions in the different provinces is given below:—

Province	Nurses employed in medical institutions					
	Rural			Urban		
	European and Anglo-Indian	Indian	Total	European and Anglo-Indian	Indian	Total
Bengal	13	29	42	392	536	928
Bihar	17	26	43	97	196	293
Bombay	2	42	44	211	957	1,168
Central Provinces and Berar	4	25	29	31	177	208
Madras	655					
North-West Frontier Province	1	12	13	5	94	99
Orissa	3	4	7	11	27	38
Sind	103					
United Provinces	257					
Assam	..	48	48	14	..	14
Delhi	..	..	..	104	200	304

The position in regard to nursing personnel indicated above is extremely unsatisfactory. Taking into consideration the fact that proper nursing is an essential part of modern medical practice, the numbers now employed in individual provinces reflect a state of affairs which will not be tolerated in any country in Europe or America. In those countries the optimum proportion of nurses to hospital beds is taken as 2·5 : 1. On this basis the total number employed in certain provinces is hardly sufficient to provide adequate nursing staff for even a single hospital of five hundred beds. Examples are Orissa, Sind and North-West Frontier Province. In the United Provinces with a population of over 50 millions, the total number of nurses employed is 257. If this country is to achieve, within a reasonable period, the nursing standards existing in other parts of the world, where health administration has advanced far more than in India, serious consideration will have to be given to the problem of producing and employing this class of auxiliary personnel on a much larger scale than has been attempted in the past.

Special Hospitals

12. We give below, in tabular form, the numbers of various types of special institutions in the provinces. The information is based partly on what has been supplied to us by the Director General, Indian Medical Service, and partly on what we obtained from provincial authorities in reply to a questionnaire which we circulated. We may also mention that, in addition to these institutions, there are in the country three special hospitals for children, two of them in Bombay and the third in Madras. While it is true that many hospitals, which provide medical care for women, also treat children, institutions devoting themselves entirely to the latter are, it is understood, limited to the three mentioned above.

A list of special hospitals and other institutions.

Serial No.	Province	Maternity and Child Welfare Centres		Eye Hospitals		Mental Institutions		Tuberculosis						Leprosy Institutions		Infectious Diseases Hospitals		Venereal Diseases Hospitals	
								Sanatoria		T. B. Hospital		Other Institutions with T. B. beds							
		No.	Total Maternity beds	No.	Total beds	No.	Total beds	No.	Total beds	No.	Total beds	No.	Total beds	No.	Total beds	No.	Total beds	No.	Total beds
1	Assam	..	..	..	..	1	716	1	28	..	..	10	98	3	..	..	..	..	..
2	Bengal	37	821	1	139	2*	115	2	51	3	318	27	247	6	585	1	18	1	82
3	Bihar	21	352	..	..	2	1,651	1	130	..	..	10	97	8	2,178	1	36	..	..
4	Bombay	118	..	3	118	5	2,259	8	593	5	239	15	202	13	1,625	3	424(for 2)	..	..
5	Central Provinces and Berar.	83	323	..	..	1	600	1	151	..	..	7	91	9	2,202	2	28	..	..
6	Delhi	34‡	..	1	74	..	..	..	..	1	96	1 (Clinic)	8	1	..	1	45	1 (Clinic)	..
7	Madras	..	..	1	170	3	1,416	5	513	1	62	17	400	12	2,902	3	210	..	..
8	North-West Frontier Province.	..	..	..	..	1†	140	1	144	..	..	6	152	..	..	..	..	..	..
9	Orissa	39	97	..	..	..	..	..	..	..	..	3	13	2	483	..	..	..	..
10	Punjab	106	345	..	..	1	1,408	9	654	3	163	14	348	6	871	..	..	..	..
11	Sind	5	..	2 hospitals and 2 mobile institutions		1	348	2	123	..	..	..	..	1	175	1	50	..	..
12	United Provinces	..	..	6	426	3	1,356	5	295	..	..	8	184	16	1,223	16	282	..	..

* In Bengal, one is an institution to which mental cases are removed for observation and the other a private hospital with very limited accommodation.
† In N.-W. F. P., (Peshawar), in addition there are two mental barracks in the Central Jail.
‡ Of these four are women's hospitals with a total bed strength of 697, of which 265 beds are for maternity and gynæcological cases.

13. In view of the wide prevalence in India of many of the special conditions of ill-health and disability included in the above table, the hospital accommodation available in each case is quite insufficient to meet the requirements of the country. We may take three instances. The total number of beds available for tuberculosis patients is about 6,000 while estimates based on standards considered necessary elsewhere will place India's requirements at about half to one and a half million beds. A conservative estimate of the country's needs in respect of hospital accommodation for mental patients places the figure in the neighbourhood of 800,000 while the available number of beds (including the Indian States) is a little over 10,000. As regards eye hospitals the existing provision is less than 1,000 beds. The Blindness Committee appointed by the Central Advisory Boards of Health and Education has estimated that the existing number of the blind in India is approximately two millions. Lieut.-Colonel E. W. O.'G. Kirwan, I.M.S. (Retd.), a distinguished ophthalmologist with many years of experience in India, has estimated that "50 per cent. of the present blindness is curable". The Committee has pointed out that other workers in this field place the percentage of preventable and curable blindness at a substantially higher figure. In the circumstances the total inadequacy of existing provision for treating eye conditions becomes apparent. It will be seen that the difference between existing hospital accommodation and what the country requires is, in each case, enormous.

14. Infectious diseases hospitals also require special mention. Their number is very small and the conditions under which they are maintained are, generally speaking, quite unsatisfactory. From the information that we have been able to gather there are not even a thousand beds in the whole country for the treatment of cases of infectious diseases. This statement requires some qualification. Each of the infectious diseases hospitals is capable of being expanded considerably to deal with the demands of an epidemic. Such an arrangement is, in our view, the result of viewing the problem from a wrong angle for, in the absence of adequate facilities for the isolation of patients, an epidemic becomes almost inevitable. For some considerable time past, it has been the practice in the United Kingdom, the United States, France, Germany and other countries, for any town of a reasonable size, which maintains a general hospital, to provide a properly built, equipped and staffed infectious diseases hospital also on a permanent basis. The money spent on the latter is not considered a waste but a wise expenditure of public funds in the interests of the health of the community. The authorities in India must develop the same point of view if the incidence of infectious diseases is to be controlled effectively.

State Aid and Voluntary Effort in the Provision of Medical Relief

15. In the organisation of medical relief for the people voluntary agencies have played a large part in most countries. In India, on the other hand, the State has undertaken the major share in making such provision. The following tables gives the number of medical institutions (latest available) in the provinces classified according to the agencies responsible for maintaining them:—

Medical Institutions in the Provinces.

	State Public		State Special						Local and Municipal		Private aided from public funds		Private non-aided		Railways		Subsidised		Total		Grand Total
			Police		Canal		Others														
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	
Assam . . .	26	13	12	15	..	..	6	..	155	22	3	3	7	2	9	4	11	..	220	59	288
Bengal . . .	12	13	1	29	..	..	7	6	1,201	139	111	26	130	56	42	35	7	..	1,511	304	1,815
Bihar . . .	14	11	1	14	2	..	..	..	367	60	15	3	52	17	24	16	53	4	528	125	653
Bombay . . .	5	33	1	3	..	..	2	4	127	182	6	16	13	45	12	33	276	..	442	316	758
Central Provinces and Berar.	2	4	..	21	..	..	4	5	133	109	14	14	53	14	10	17	7	..	223	184	407
Madras . . .	78	98	3	5	1	..	13	..	380	99	46	19	48	30	26	25	377	..	972	276	1,248
North-West Frontier Province.	52	4	5	12	2	..	38	4	19	20	1	1	5	13	..	5	1	..	123	59	182
Orissa . . .	38	6	..	4	..	1	1	..	96	7	4	2	6	..	7	1	8	..	160	21	181
Punjab . . .	1	63	..	32	69	4	14	11	570	106	11	25	4	6	1	40	108	..	778	287	1,065
United Provinces .	56	12	..	48	3	..	4	57	246	146	10	48	45	20	7	55	85	..	456	388*	844
Sind† . . .	1	8	..	..	..	..	1	..	71	48	19	9	1	13	2	10	..	..	95	88	183
Delhi . . .	..	5	..	1	..	..	..	..	7 (District Board)	18	..	6	‡	‡	..	2	..	..	7	32	39

*Includes one Government and one aided teaching institutions. †Figures for Sind relate to the year 1937-38. ‡ Not known.

It will be seen that, of the total number of 7,441 medical institutions in the provinces, only 566 or 7·6 per cent. are maintained wholly by private agencies. Of the remaining 6,875 institutions, 94·5 per cent. constitute entirely a charge on public funds (provincial and local body) while the remaining 5·5 per cent. receive grants-in-aid from such funds. The share that public revenues have borne in the provision of medical relief to the people is therefore very high.

16. This brief review of existing provision for medical relief in the country has made it clear that only a fraction of the requirements of the people is being met by the present services. Further, the quality of the medical aid made available to them is altogether of a low standard and it seems reasonable to hold that, from the point of view of effective relief to the patient, the return for the expenditure incurred (mainly by the State) is inadequate. When it is remembered that, in the past, the major effort in the field of health administration has been directed to the expansion of medical relief, the results achieved must be considered disappointing. We cannot help feeling that one of the causes responsible for this state of affairs has been the attempt to establish medical institutions without providing for their proper staffing, equipment and maintenance. The need is great for raising definitely the standard of medical service rendered by existing hospitals and dispensaries. It is equally necessary that the number of institutions should be increased considerably in order to bring them closer to the people and thus promote, in a growing measure, the application of modern scientific medicine to the improvement of the health of the country.

Preventive Health Work in the Provinces

17. We have already shown in the last chapter how the provision of whole-time public health staffs in rural and urban areas was actively promoted, in a number of provinces, by the new Ministries of Health which came into existence when the provisions of the Government of India Act of 1919 were brought into operation. The extent to which such services were provided was greater in some provinces than in others. The following tabular statement sets out the public health staff employed in the different provinces and Centrally Administered Areas. These figures were supplied by the Provincial Directors of Public Health in 1944:—

The staff employed for preventive health work in rural and urban areas for the different provinces.

Provinces	Population		Medical officers on preventive health work.															
			Medical graduates holding public health qualifications				Medical licentiates holding public health qualifications				Medical graduates without public health qualifications				Medical licentiates without public health qualifications			
			Whole time		Part time		Whole time		Part time		Whole time		Part time		Whole time		Part time	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
North-West Frontier Province	2,485,874	552,193	..	1	1	..	..	..	..	..	..	..	5	..	..	2	..	2
Punjab	24,059,855	4,358,964	28	13	..	4	..	..	..	..	..	1	..	39	9	1	4	27
United Provinces	48,165,349	6,855,263	47	22	1	..	97	13	..	..	..	..	..	..	..	..	..	..
Bihar	34,383,932	1,956,219	17	7	..	3	..	1	..	..	..	2	..	..	..	1	..	..
Orissa	8,407,743	320,801	5	1	..	..	1	1	..	..	..	1	..	..	3	2	..	..
Bengal	54,367,749	5,938,776	27	27	..	..	8	1	..	..	..	4	..	..	62	7	..	..
Central Provinces and Berar	14,719,817	2,093,767	..	3	..	..	..	1	..	..	..	..	..	..	..	..	..	..
Bombay	15,437,671	5,412,169	2	12	..	..	..	1	..	..	..	..	..	..	..	1	..	..
Sind	3,643,305	891,703	..	7	..	..	..	1	..	..	1	..	..	..	2	..	..	..
Madras	41,476,927	7,864,883	39		..	..	35		..	..	10		..	..	56		..	..
Assam	9,924,111	280,622	5		..	..	..	9	..	..	3		..	..	82	47	..	..
Delhi	222,253	695,686	2	5	..	2	..	..	..	..	..	..	..	..	..	5	..	..
Coorg	157,508	11,218	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
Baluchistan	401,168	100,463	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..

The staff employed for preventive health work in rural and urban areas for the different provinces—contd.

Provinces	Sanitary and Health Inspectors		Vaccinators				Midwives		Trained *dais*	
			Males		Females					
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
North-West Frontier Province	..	11	36	18	..	1	..	2	53	10
Punjab	67	185	370	160	..	5	‡	‡	‡	‡
United Provinces	223	208	762	195	..	..	160	199	54	80
Bihar	*186*		1,422	..	..	..	..	1	1	..
Orissa	56	15	303	10	5	2	2	4	10	16
Bengal	691	112	2,176	145	53	30	53	88	3,317	728
Central Provinces and Berar	..	63	286	94	..	..	..	104	76	608
Bombay	12	132	281	59	..	..	‡	‡	‡	‡
Sind	11	45	88	27	..	6	7	12	33	18
Madras	514	300	..	229*	679†	..	176	285	4	..
Assam	95		45		..	..	..	..	..	..
Delhi	8	29	22	18	17	..	8	1	17	39
Coorg	2	2	..	..	..	..	4	2	..	..
Baluchistan	4	5	7	1	..	..	..	2	..	6

* Includes males and females.

† Includes males and females.

‡ No figures available.

18. In 1935 nearly half the districts and three quarters of the municipalities in British India had no qualified health officers. Between 1935 and the period to which the figures given above relate, the number of whole-time health officers, who are graduates in medicine and possess a public health qualification, increased only by 6 and the corresponding number of health officers who are licentiates increased by 18. For taking charge of rural health work in the districts and of urban health administration in the larger municipalities the health officer is generally required to possess a degree in medicine and a recognised public health qualification. Licentiates with special training in public health are generally appointed to the smaller municipalities. It will be seen that the progress made since 1935 in providing qualified whole-time health officers to rural and urban areas in the provinces has been very small. During the same period the number of sanitary or health inspectors employed in the country as a whole increased by 656, making a total of 2,976. We understand that a special Committee consisting of certain Directors of Public Health, the Directors of the Central Research Institute, Kasauli, the School of Tropical Medicine, Calcutta and the Pasteur Institute, Shillong, and some others, which discussed the problem of smallpox vaccination at New Delhi on 22nd November 1944, recommended that one qualified sanitary inspector should be appointed for every group of 25,000 people. Therefore, on the assumption that the population of British India is 300 millions, the number required is 12,000 as against the existing number of about 3,000.

19. The increase in the number of vaccinators during the same period was 925. A striking feature is that, as regards women vaccinators, the total increase in British India was exceedingly small. In 1935, only 45 women vaccinators were employed in the rural areas of the country and 37 in the urban areas. In the period intervening between 1935 and the year to which the figures in the above table refer (probably 1943 or 1944) the number of these women workers rose to 75 in the rural areas and to 44 in urban centres, a total increase of 37 for the country. In many parts of India it is only a woman vaccinator who can obtain access to the homes of the people and mix freely with the women. Therefore the extreme inadequacy of the existing numbers of women vaccinators available in the rural and urban areas of the country and of the rate at which their strength is augmented becomes emphasised.

20. Midwives and trained *dais*, who form an essential part of the special health services required for mothers and children, are also quite inadequate in numbers in all the provinces. We are discussing this matter as well as the extreme insufficiency of health visitors in that chapter of this volume which deals with services for mothers and children and shall not therefore go further into them here.

21. Apart from the inadequacy of staff indicated above, the quality of the preventive health service given to the people suffers considerably from the fact that the non-medical personnel discussed

in the preceding paragraphs lack adequate training and work under conditions which are not calculated to promote their efficiency. The deficiencies in existing standards of training have been discussed in the chapter relating to the survey of professional education. The conditions of service for these classes of health personnel vary considerably in the provinces, whether they be employed by Governments or by local bodies. We shall take sanitary or health inspectors first. In Bengal, the Central Provinces and North-West Frontier Province, Governments do not generally employ them while, in Bihar, it is understood that their services have been utilised by the Provincial Government only in connection with A.R.P. work at refugee camps and at aerodromes. The scales of pay offered to such inspectors varied from Rs. 30 to Rs. 40 a month. In other provinces the scales for inspectors in Government service range between Rs. 75 to 135 in Bombay and Rs. 40 to Rs. 80 in Orissa. As regards local bodies the variation is even higher, from a scale of Rs. 100 to Rs. 150 for district board sanitary inspectors in Bengal to Rs. 25 to Rs. 40 in certain local bodies in Orissa. The sanitary inspector is responsible for supervising the enforcement of the sanitary law in his area and an essential condition for efficiency is that he should be above temptation. The existing scales of pay in certain provinces are so low that no suitably qualified man can be expected to serve contentedly on such emoluments. The continuance of such rates of pay can only lead to inefficiency or corruption or both.

22. The position in regard to vaccinators is even worse. The range of variation in salary is from Rs. 10 in Bengal to Rs. 50 for a first class vaccinator in Madras. In the majority of the provinces the scale of pay is low. In Bihar and Orissa the conditions of service are most unsatisfactory. In the former vaccinators, who are paid from public funds, are employed only in municipalities. In rural areas they are normally engaged for duty only for the vaccination season (October to March), although they may also be called upon to work during an emergency. The fees realised for vaccinations carried out in the homes of the people form their sole remuneration. These vaccinators are given no travelling allowance.

23. In the rural areas of Orissa vaccinators work under a system of licence granted by the Provincial health authority. He is permitted to charge As. 2 for each successful vaccination and a fee of As. 4 for more than one successful vaccination in the same family, provided the operation is performed in the homes of the people. Vaccinators are required to perform all vaccinations, free of charge, if carried out in public places. Such low rates of remuneration and absence of security of tenure must make efficient service impossible. Vaccinators working in rural areas must be performing these duties under strenous conditions and the withholding of travelling allowance from them can hardly be expected to promote efficiency. One of the reasons why vaccination against smallpox has not produced in this country such marked decline

in the incidence of the disease as has been demonstrated to be possible elsewhere is that the campaign has not been conducted in a manner calculated to produce effective immunisation of the people. Conditions of service such as those described above are a positive impediment to a successful vaccination programme.

24. We may also draw attention to another matter affecting the efficiency of the existing public health staffs in the provinces. In certain provinces they are servants of the local bodies in which they work. In others Provincial Governments have undertaken the maintenance of cadres for certain classes of health officials on a provincial basis. The general experience is that provincialisation of the services helps to secure and retain better types of workers on the public health establishments than a system of separate organisations maintained by individual local authorities.

25. From this brief survey of preventive health services in the provinces it will be seen that the existing staffs are altogether too small to provide adequate service to the large populations entrusted to their charge. Even in those provinces in which the preventive health organisation has been best developed, the staff employed can be considered to constitute only a nucleus from which must be expanded the much larger army of workers required for providing efficient service to the people. The existing public health staffs are mainly engaged on measures for the control of epidemic diseases and they are unable to cope adequately even with such measures.

26. Before we conclude this survey of existing provision in the provinces for medical relief and preventive health work, reference should be made to such laboratory services as are available for the medical and public health departments. For the proper diagnosis and treatment of disease laboratory facilities are essential while, in the field of preventive health work, food, water and sewage analyses and a diagnostic service in connection with the campaign against communicable diseases represent some of the important functions which the laboratory should perform. In addition, research into the varying problems of ill-health in the community, which arise from time to time, also constitutes a valuable contribution which the laboratory should make if sound health administration is to be carried on. In the provinces of Madras and Bombay the King Institute, Guindy, and the Haffkine Institute respectively are well equipped to carry out all these duties. The laboratory organisations in the Punjab and in the United Provinces, although they are not up to the standards of the institutions in Bombay and Madras, are adequate to fulfil the requirements of the respective public health departments. In other provinces the laboratory facilities that are available are of a lower standard and they vary to some extent from province to province. We have described, in some detail, the existing laboratories in the different provinces in the chapter dealing with the review of medical research in this volume of the report and do not therefore propose to go into further details here.

CHAPTER IV.

THERAPEUTIC SUBSTANCES AND MEDICAL APPLIANCES, THEIR AVAILABILITY AND CONTROL OF THE TRADE IN THEM

Introduction

1. We have found considerable difficulty in reviewing this important subject. There was, till recently, no specific enactment of the Indian Legislature which aims directly at the prevention of adulteration of drugs or which ensures conformity to proper standards of purity and strength in their manufacture. There are indirect provisions contained in the Indian Sale of Goods Act, 1930 (Section 15); the Sea Customs Act, 1898 (Sections 3, 6, 7, 9 and 17) and the Indian Penal Code (Sections 274, 275, 276 and 475). Further, legal control is to be found in the Cantonments Act, 1924, which empowers the Cantonment Authority to deal with "any article of food or drug" which is adulterated or different from that which it is represented to be within the Cantonment areas. In the Poisons Act, 1919 and the Opium Act, 1878, and the Dangerous Drugs Act, 1930, attempts have been made to control, to some extent, the manufacture, importation and sale of certain drugs, but the provisions laid down in these various Acts have no immediate bearing on the subject of adulteration or the standards of strength or purity of drugs in general. This position has been rectified by the passing of the Drugs Act, 1940, referred to in the succeeding paragraph.

The Drugs Act, 1940

2. In 1930 the Government of India appointed the Drugs Enquiry Committee under Sir Ram Nath Chopra to investigate the drug position in India. In 1940 the Drugs Act was passed by the Central Legislature giving statutory sanction to the recommendations of that Committee regarding drug control. This Act provides for the control of drugs imported into India as well as of their manufacture, sale and distribution in the country. The Central Government is responsible for the control of import, while the Provincial Governments are authorised to regulate the manufacture, sale and distribution of drugs inside their respective territories. In order to carry out these purposes the Act provides that the Central Government shall, as soon as may be, constitute a Board to be called the Drugs Technical Advisory Board as well as a Central Drugs Laboratory. The Drugs Technical Advisory Board, which has already been appointed, is responsible for advising the Central and Provincial Governments on technical matters connected with the administration of this Act. It has had several sittings and has advised the Government of India on the compilation of the Drugs Rules under the Act. These Rules were published for criticism in April, 1944, and it is understood that, after such criticism was fully considered by the Drugs Technical Advisory Board and the Central Government, the draft Rules are now in their final form for publication at an early date. It is believed that the Drugs Act and the Rules under it will come into force early in 1946.

3. The Central Drugs Laboratory has not yet been established. Its function will be to carry out the analysis of samples of imported drugs and biological products sent to it from the ports as well as of samples of drugs submitted from the provinces to be analysed for a second opinion. This laboratory will also be responsible for the grant of certificates of registration in respect of imported patent or proprietary medicines with undisclosed formulae. The Government of India established, about ten years ago, a Biochemical Standardisation Laboratory for the purpose of working out details regarding biochemical estimations, when carried out under tropical conditions. This laboratory can suitably constitute the nucleus organisation from which the Central Drugs Laboratory required under the Act may be developed. During the war, the Military Authorities and the Supply Department used extensively the Biochemical Standardisation Laboratory for testing drugs and, in this way, it has developed a wide range of experience in the testing of these substances.

4. The Central Government is also authorised, under the Act, to constitute an advisory committee to be called the Drugs Consultative Committee to "advise the Central Government, the Provincial Governments and the Drugs Technical Advisory Board on any matter tending to secure uniformity throughout the provinces in the administration of this Act". This Committee will consist of two representatives nominated by the Central Government and one representative nominated by each Provincial Government. It has not yet been established.

5. As has already been pointed out, the control of the manufacture, sale and distribution of drugs within their own territories is the function of Provincial Governments. In order to carry out these duties the Act provides for the appointment of Analysts and of Inspectors by these Governments. The provincial Analyst will normally be responsible for the analysis and certification of samples of drugs taken by the Inspectors but, in cases of dispute, a second opinion can be obtained from the Central Drugs Laboratory either by the court or by any of the parties involved in the prosecution of a case.

6. The control of the therapeutic substances commonly known as vaccines and sera will also be carried out under the Drugs Rules and the Drugs Act. The control of the manufacture, import and sale of these substances is on very similar lines to those of the Therapeutic Substances Act, 1925, of the United Kingdom. During the War a large number of firms have set up business in the manufacture of sterilised products such as vaccines and sera. We recognise that some of the leading commercial firms in India have already made great strides towards the production of biological products under much more satisfactory conditions than was formerly the case, but the need exists for the continuous supervision of their preparations.

Drugs and Medical Appliances Manufactured from Indigenous Material

7. We propose to refer to a few important drugs manufactured from raw material found in India, the production of which has received a stimulus on account of the War.

Morphine.—This drug is derived from opium, the manufacture of which is controlled by the Central Board of Revenue. The production of morphine has been immensely stepped up and improved and there seems to be little reason why India should not be able to meet her entire demand herself.

Codeine.—The local manufacture of this drug has also been considerably increased recently and India is now in a position to meet her normal civil requirements and even to export a small surplus in peace time.

Strychnine.—Local production has greatly increased and a large export trade, especially to Australia, has been built up.

Caffeine.—India is now a very large producer of Caffeine as it was in the last war, but the industry did not survive post-war (1914-18) competition.

Santonine.—Sufficient is now produced to satisfy India's requirements and to export a surplus.

Quinine.—We have referred to this in the section dealing with malaria, with the suggestion that, for any future planning, the question of the cultivation of cinchona and the production of quinine on a much larger scale than anything that has yet been attempted, should be given a prominent place.

Pyrethrum.—Experiment in the growing of this useful plant has demonstrated that there are many areas in India where it can be grown and where its flowers produce a reasonable pyrethrin content. The Government of India purchased 236,000 lbs. of Indian grown pyrethrum during the period from 1st June 1944 to the end of May 1945. This represents probably the bulk of the pyrethrum grown in India at the present time.

Ipecacuanha.—It is now thought that, if proper attention is paid to the growing of this root in India, we should be able not only to supply our own needs but also to produce a surplus to export.

We have selected at random some of the more important drugs, our purpose being to indicate that there lies a considerable future before the drug manufacturing industry in India. We should emphasise, however, the necessity for the institution, as early as possible, of effective control over the production of drugs, if the trade is to be developed. Little effort has yet been made in India to recover valuable chemicals from coal tar which form the basis of many synthetic drugs. A certain amount of Carbolic Acid, Benzene and Toluene is recovered in India at present from coal tar. Much larger quantities of these products are, however, lost because the producing interests concerned find it suits them better to manufacture tar for use on roads.

Medical appliances such as surgical dressings, Plaster of Paris, artificial limbs and dental cotton are now produced in India in large quantities. The surgical instruments industry has also developed enormously but is still dependent on many imported raw materials for its work.

Pharmacy Legislation

8. The Drugs Act and the Rules under it should be supplemented by legislation to regulate the practice of pharmacy. We understand that this is being provided for by a Pharmacy Act which will be brought before the Indian Legislature shortly. This Pharmacy Act will, we believe, establish a Central Council of Pharmacy to regulate the education of pharmacists and the standard of examinations to be passed by qualified pharmacists. The Act will also, it is understood, arrange for the establishment of Provincial Councils of Pharmacy to maintain registers of qualified pharmacists and to regulate the professional conduct of pharmacists.

Manufacture of Scientific Glassware

9. An important industry in connection with the supply of medical equipment is that connected with the manufacture of glassware. There exists a sufficient supply of the necessary raw material in the country with a long tradition in the manufacture of glass articles of a simple nature. We are informed that, at the outbreak of the War, no scientific glassware was being produced in India and that no laboratory equipment was being made of neutral glass. This position has been changed and neutral glass, which is necessary to store certain medicines and biological products, has been and is being produced in this country.

CHAPTER V

THE NUTRITION OF THE PEOPLE

Nutrition

1. A population which is habitually used to a diet which is sufficient in both quality and quantity will have a store of general health and vitality, which will enable it both to resist the onset of disease and successfully to combat it, when it arises. On the other hand, faulty nutrition is directly and indirectly responsible for a large amount of ill-health in the community. A continued insufficiency of specific food factors in the diet is associated with special conditions known as deficiency diseases. These include beri-beri, which is fairly common among adults and infants in the Northern Circars of Madras Presidency, keratomalacia a common cause of permanent blindness in South India, osteomalacia and rickets in certain parts of North India, and goitre in some areas in the Himalayan and Sub-Himalayan regions.

Estimates of Food Production

2. It is very difficult to obtain accurate information in regard to food production in the country. Statistics of various crops and their total areas are published annually by Provincial Governments and are tabulated at the Centre. Little reliance can be placed, however, on these. For example in some provinces, *e.g.*, Bengal, Bihar, Assam and Orissa, the area under the different food crops cannot be accurately estimated. Production figures are available for only 56 per cent. of the Indian States' territory, yet the latter comprises 45·3 per cent. of the total area of India and contains 24 per cent. of the country's population. In the absence of accurate statistics with regard to food production, it is only possible to make a conjectured estimate of the overall position. The bulk of a typical Indian diet is composed of cereals and it is, therefore, with the production figures of these that we are primarily concerned. The Food Grains Policy Committee (1943) considered that a reasonable estimate of the total annual production of cereals in India is 50 to 55 million tons. From this total quantity a deduction, the amount of which cannot be assessed, should be made for the grain fed to live-stock. The next step is to correlate this total estimated production with the needs of the community. For a population for which one or other of the cereals represents the basic food, nutrition experts have suggested that 1 lb. per head per day may be taken to represent the reasonable requirements of the individual. Taking the population of the whole of India as approximately 400 millions, at least 65 million tons of cereals will be required annually for human consumption. It is clear that the production of cereals in India falls short of the country's reasonable requirements.

Cereals, *i.e.*, mainly rice and wheat are, however, only part of a satisfactory diet which should include adequate quantities of other foods such as milk, pulses, vegetables, fruit, meat, fish and eggs.

Milk.—Taking milk and dairy produce in general and again emphasising the fact that it is possible to make only very rough estimates of total production, we believe that the probable figure

for the total annual production of milk is about 22 million tons.* If from this we deduct about 15 per cent. for the needs of calves there is left, in terms of fresh milk, a possible daily *per capita* intake of about 5 ozs. It must, however, be appreciated that the production of milk varies very considerably in different parts of India. It approximates to 19·7 ozs. per head of population in the Punjab and 3·6 ozs. in Madras Presidency and we believe that, in India as a whole, the diet of the poorer classes includes milk, if at all, only in negligible quantities.

Pulses.—Pulses are grown throughout India and are consumed by all classes in the country. They are, as a matter of fact, essential to agriculture since, in the absence of the cultivation of leguminous crops in rotation, the fertility of the soil cannot be maintained. The estimated total annual yield of pulses is some 7 to 9 million tons which, on a *per capita* basis, provides less than 3 ozs. a day. This is again much below the desirable limit.

Vegetables and Fruits.—Such information as is available would seem to show that vegetables are grown in altogether insufficient quantities. Further, we believe that an unsatisfactory feature is that fruits and vegetables of the less nutritious varieties are often produced in preference to those of higher nutritive value.

Eggs, Meat and Fish.—Eggs are consumed in quite negligible quantities by the poorer classes in both villages and towns and are frequently excluded from the dietary on account of religious objections. The total production of eggs is believed to be small in relation to the daily *per capita* requirement. The live-stock of India is considerable and, probably, in many areas there are actually too many cattle. Meat, however, forms a very small part of the diet of the greater section of the population. Here again social custom plays a part but, in many cases, price is a decisive factor.

Fish is a source of food which as yet is undeveloped, although it is understood that some expansion of this industry has taken place within recent years. The average annual production is about 660,000 tons, the bulk of which is sea fish. We understand that the Government of India and Provincial Governments are attempting to increase fish production, popularise the use of this most nutritious food and provide the necessary facilities for its distribution.

Sugar.—This article of food is produced in very large quantities in India, which indeed produces more sugar than most other countries in the world. The total production of sugar, refined and unrefined, is estimated at 5·3 million tons which amounts to approximately 1·3 oz. *per capita* daily. This, however, is a quantity considerably below what is consumed in normal times in Great Britain and the United States of America.

The only important article of food imported into India before the war was rice from Burma and, to a smaller extent, from Siam

* The production figures for different articles of food are quoted from the pamphlet on nutrition in the Oxford Pamphlet Series, by Dr W. R Aykroyd (May 1944).

and Indo-China. In normal times, the total amount imported was some 4 to 5 per cent. of India's rice supply. The import of other foodgrains was negligible.

This brief review of food production is, we consider, sufficient to warrant the statement that the total food supply is insufficient in quantity and that the diet of the population as a whole is defective in quality, since the protective foods which are needed to supplement the basic cereal grains are not produced in anything like adequate quantities.

Storage and Distribution of Food

3. In order to ensure the satisfactory nutrition of the people, food production on a scale sufficient to meet the country's requirements should be linked with measures which will help to enable all sections of the population to obtain a balanced diet. Provision for the proper storage and distribution of food constitutes an important part of such measures. We are satisfied that a very great deal needs to be done in these directions throughout the country as a whole. The provision for the rapid and efficient transportation of perishable foods from one part of the country to another is extremely inadequate and this remark applies particularly to fruit and fish. We shall refer specifically to the question of the production and distribution of milk later. We recognise that the distribution of food is a very complicated matter, involving as it does problems of transport and marketing. These factors have an intimate bearing on the price of food, which ultimately determines the level of nutrition in the community.

The Economic Aspect of the Problem

4. The Nutrition Research Laboratories at Coonoor have suggested that the following additions to one pound of cereals will constitute a sufficient and well-balanced diet for an ordinary adult per day:—

	oz.
Milk	8
Pulses	3
Non-leafy vegetables	6
Green-leafy vegetables	2-4
Fruits	2
Fats, oils	2

The cost of a diet such as that described above would vary between Rs. 4 and Rs. 6 a month in pre-war days. Taking an average family as containing the equivalent of four adult persons, the cost of food for such a family would vary between Rs. 16 and Rs. 24 a month. These figures give a striking illustration of the gulf that existed between the expenditure necessary on food and that which large numbers of workers could afford, having regard to their wages. A peon in the Government of India Secretariat was paid as little as Rs. 15 per month in the pre-war period. In spite of allowances to meet the increased cost of living there is no reason to believe that the gulf has in any way been narrowed.

5. Attempts have been made to study the relation between income and diet in various parts of India, chiefly in industrial areas, from which it has been deduced that there is normally a rise in the consumption of non-cereal foods, *e.g.*, milk, vegetables and fruit, with an increase in income. This means that in this country, as elsewhere, an increase in income generally leads to improvement in the diet in the right direction.

6. Diet surveys carried out in different parts of the country have shown, in typical urban and rural groups, that the food consumed is insufficient to provide the necessary energy requirements in the case of some 30 per cent. of the families, that the diet is almost invariably ill-balanced and that there is, in terms of food factors, a deficiency in fats, vitamins, and proteins of high biological value. The insufficiency of these essential food factors in the diet of large sections of the people is, no doubt, a contributory factor to the high incidence of morbidity and mortality in the country. Infants and expectant and nursing mothers particularly require such important elements in their food and the malnutrition resulting from the absence or inadequacy of these in their diet is responsible, in part, for the high rates of infantile and maternal mortality. There is also a close association between the prevalence of tuberculosis and defective diet.

Nutrition Work in India

7. While the basic problems relating to food production and distribution remain to be tackled, it may be mentioned that, within recent years, some advance has been made in defining the extent and nature of the nutrition problem in India through diet surveys and through research into various aspects of the subject. In addition, a beginning has been made in the training of health workers in the field of nutrition. Much of this work has been carried out under the auspices of the Indian Research Fund Association, which is almost entirely financed by the Central Government. This Association maintains the Nutrition Research Laboratories at Coonoor, which have taken a prominent part in the activities mentioned above. The Nutrition Advisory Committee appointed by the Association, which consists of leading nutrition workers in the country, Central and Provincial Health Department Officers and representatives of the Agricultural and Animal Husbandry Departments, is performing valuable work by directing nutrition research carried out in different parts of the country under the auspices of the Association and by discussing national nutrition problems from the technical point of view. The recommendations of the Committee are communicated to Provincial Governments through the Government of India.

8. The diet surveys have helped to provide the outlines of a picture presenting the dietetic habits and nutritional status of the people and, howsoever incomplete in details this picture may be, it has served the valuable purpose of stimulating public interest and of providing material on which administrative action can be initiated for a comprehensive policy directed to the raising of the standard of nutrition in the community. The promotion of active research

by the Indian Research Fund Association in nutrition problems, in various centres in India, including the universities, has helped to produce a body of keen and capable nutrition research workers, who are bound to play an important part in the campaign for raising the general standard of nutrition. Such research has been correlated to some extent, though perhaps not as much as it should be, with similar activities carried on by agricultural and veterinary officers through facilities afforded by the Imperial Council of Agricultural Research. The results have been made available to administrations and others interested in this problem, through reports of the Nutrition Advisory Committee of the Indian Research Fund Association and through Bulletins published by the Nutrition Research Laboratories at Coonoor and by the Imperial Council of Agricultural Research and other institutions. A scheme of training for nutrition officers was inaugurated in 1937 at the Nutrition Research Laboratories, Coonoor, and, up to date, the Governments of Bengal, Bihar, Madras, Bombay, the Punjab, Hyderabad (Deccan) and Baroda have appointed special Nutrition Officers. Thus the ground is being prepared for a continuous study of the nutrition problems of the country and for the practical application of the knowledge in the subject, which the country already possesses. But this, in our view, is no more than a beginning. Speaking generally, comparatively little has been done by Provincial Governments in this field and the responsibility rests on them to place in the forefront of their reconstruction programmes, measures for dealing with this problem, the solution of which is fundamental to the welfare and progress of the people.

9. We have refrained from making a reference to the activities of the Food Department of the Government of India because we have, as has already been pointed out, confined our review of this and other subjects relating to the public health of the country to the period ending with the year 1941.

Supervision of Food Supplies to ensure the Maintenance of Health Standards

10. We shall consider here the action taken by health authorities for the control of food adulteration as well as for the supervision of the production and sale of various articles of food for public consumption.

11. *Control of food adulteration.*—The responsibility for controlling food adulteration rests on Provincial Governments. In all provinces the necessary powers have been provided by Provincial Food Adulteration Acts. These Acts entrust the enforcement of the law against adulteration to local authorities and give considerable powers of supervision and control to Provincial Governments. Each Government is empowered to apply the Act concerned either to the whole area under its charge or to particular local areas as well as to apply it to all or to specific articles of food. In the two provinces of Bihar and the United Provinces the Act

concerned provides for the control of adulteration of drugs in addition to that of food.

12. Adulteration of different articles of food is widely practised in the country. In 1940, of the total number of samples examined in each province, the highest percentage of adulteration was recorded in the Central Provinces (84·9 per cent.)* and the lowest in Sind (19·9 per cent.). An inter-provincial comparison based on such figures is not, however, justified because the extent of territory over which the Food Adulteration Act has been made applicable in the different provinces varies considerably as well as the vigour with which it is enforced. For instance, the Food Adulteration Committee of the Central Advisory Board of Health stated in its report that it " formed the opinion that, in large areas in which the Act is said to be in operation in certain provinces, its working can exist only on paper ". The Committee has drawn attention to the fact that the methods of analysis employed in the provinces have not been standardised and this may also explain, in part, the divergence between the percentages for individual provinces.

13. The chief articles of food which are found adulterated are milk and milk products and the edible oils. The percentage of adulterated samples in respect of milk and milk products varied, in 1937, from 100 per cent. in the case of the Central Provinces and Delhi to 15·9 per cent. in the case of Sind. Samples of edible oils showed percentages of adulteration ranging from 80·0 per cent. in Bengal to 5·4 per cent. in Assam.

14. The defects in the enforcement of the food adulteration law in the provinces include the following:—

(1) In certain provinces the operation of the Act has been extended to specific areas, without due regard being given to the need for ensuring that the local authorities concerned possess adequate funds and personnel to enforce the Act.

(2) In many areas local authorities have availed themselves only to a very limited extent, or not at all, of the existing facilities for taking samples and getting them examined. The Food Adulteration Committee has pointed out that " in the Punjab, the United Provinces and Baroda there are instances of local bodies failing to send even a single sample for examination during 1940, while in certain other provinces the number of samples from individual local bodies is as low as one or two for the whole year ".

(3) Failure to prosecute offenders under the Act is to be found to a varying extent in the different provinces. The power to sanction prosecution is vested in the executive authority of the local body concerned. As has been

* These and other figures relating to food adulteration are quoted from Parts I and II of the Report of the Food Adulteration Committee of the Central Advisory Board of Health (1939 and 1943).

pointed out in the second chapter of this volume of our report, the Chairman of the local body, who is the executive authority in most parts of the country, often finds it difficult to enforce the law in the face of opposition from vested interests, probably because he lacks the support of a strong public opinion for such enforcement in the interests of the community. Instances have been quoted, by the Food Adulteration Committee, of local bodies having instituted no prosecutions at all and of others in whose case only six per cent. or less of the total number of offenders under the Act were prosecuted.

In this connection it may be mentioned that, in the province of Madras, all the executive powers under the Food Adulteration Act were transferred, under the provisions of the Madras Public Health Act, 1939, to local health officers. Further, the Provincial Government has issued instructions that every case of adulteration should be prosecuted. It is understood that, in this province, the vendors of all samples certified by the public analyst as adulterated are invariably prosecuted, except where accidental adulteration is suspected. In such cases the vendor is warned and another sample taken at a later date.

(4) The fines imposed by the courts are, in many cases, so light that they have no deterrent effect on the offenders. Imprisonment, if it can be awarded for repeated offences under the Act, will have a salutary effect. In certain provinces, however, there exists no provision for imprisonment for offences under the Act.

(5) Delays in the disposal by courts of cases under the Act, sometimes as long as a year and a half, are said to have hampered the working of the Act in certain provinces.

15. *Control of the production and sale of food to the public.*— The provincial Local Self-Government Acts contain provisions enabling the local authority to control, from the hygienic point of view, the production and distribution of food and articles of drink such as aerated waters, when they are meant for human consumption. Such control extends to markets, slaughter houses, bakeries, sweetmeat shops and eating establishments, dairies and the collection, transport and distribution of milk and milk products and the sale of meat, fish and other articles of diet. No person can establish a market or a slaughter house or carry on the other trades mentioned above in the area of a local authority without obtaining a license from it. In granting the license, that authority can lay down such conditions as it deems necessary to ensure the effective observance of health standards. At least in certain provinces local bodies also possess the power to seize and destroy articles of food unfit for human consumption if they are perishable and, if not, to do so under the orders of a magistrate.

16. It may, however, be mentioned that, in respect of the vast majority of local authorities, the control exercised is so unsatisfactory that the conditions under which food production and sale to the public are taking place constitute a grave menace to the health of the people. In many cases, the sanitary conditions of markets and slaughter houses maintained by the local bodies themselves fall far below minimum standards of hygienic requirements.

CHAPTER VI

HEALTH SERVICES FOR MOTHERS AND CHILDREN

The extent of Morbidity and Mortality among Mothers and Children

1. The importance of the health problems of mothers and children become emphasised from a consideration of the following facts. Nearly one-half of the total deaths at all ages in British India takes place among children under 10 years. Of these nearly a half is among infants under one year. A conservative estimate of the annual number of deaths among women in the reproductive ages from causes associated with pregnancy and childbearing is 200,000 while the number of women who have to undergo, each year, varying degrees of disability and suffering from the same causes is likely to be about four millions if the ratio of maternal morbidity to mortality considered reasonable elsewhere can be applied to India.

2. Some idea of the relative effect of the causes associated with pregnancy and childbearing in raising the mortality rate of women in this country as compared with that of England and Wales may be obtained from the figures given below:—

—	Period.	Sex.	0-1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49
British India,	1930-32	M	184·4	37·6	10·0	6·3	8·9	9·5	..	12·6		18·7	
		F	167·1	34·6	9·9	6·3	10·6	11·9	..	13·3		16·3	
England and Wales,	1930-32	M	72·2	7·5	2·3	1·5	2·5	3·3	3·3	3·6	4·8	6·4	9·3
		F	54·9	6·8	2·0	1·4	2·3	2·8	3·1	3·3	3·9	4·9	6·7

In England and Wales female death rates are lower than those for males at practically all the age periods, although there is a noticeable lessening of the difference between the two rates during the years that constitute the reproductive period for women. This is due to the added risk of death which childbearing brings to women during those years. On the other hand, in India, this risk is presumably greater than in England and Wales because the female death rates during 15-40 are distinctly higher than the corresponding rates for men although, at the earlier and later age periods, these rates are, as in the case of England, lower than those for males.

3. The high rates of sickness and mortality among children must result, apart from the large amount of preventible suffering and economic loss it produces, in the survival of a proportion of them with varying degrees of damage to their physical and mental powers, so that the contribution which they may normally be expected to make to the general welfare of the community will naturally become reduced. The prevailing high rates of maternal morbidity and mortality are also bound to exert an adverse influence on the health and happiness of the children and other members of the affected homes. When it is remembered that, in certain countries, the rate of infant mortality

is only about a third to a fifth of that of India and that the maternal death rate has been brought down to about 3 to 4 per 1,000 births as against India's estimated rate of 20 per 1,000, it becomes possible to obtain some idea of the extent of damage that preventible causes produce among mothers and children in this country.

Measures necessary for the Protection of Motherhood and Child Life

4. "The health of the people depends primarily upon the social and environmental conditions under which they live and work, upon security against fear and want, upon nutritional standards, upon educational facilities and upon the facilities for exercise and leisure." We shall not consider the problem here in this wider aspect but shall confine ourselves to the question of essential services to protect the health of mothers and children. These services should provide for the antenatal supervision of expectant mothers, for skilled assistance at childbirth, including institutional facilities where necessary, for the postnatal care of mothers and for adequate health protection to children from birth through the successive stages of infancy and early and later periods of child life. From the general description we have already given, in Chapter III of this volume of the report, of the existing health organisation in the provinces, preventive and curative, it will be seen that the provision is altogether inadequate to meet the needs of the community as a whole. In the field of maternity and child welfare the position is no better and is perhaps even worse. The development of special health services for mothers and children is relatively of more recent date than that of general medical provision for the community even in those countries in which health administration has advanced to a greater extent than in India. Here the growth of maternity and child welfare work has been, broadly speaking, mainly through voluntary effort and there is not, as yet, evidence of an adequate recognition by Governments of the need for an organised programme of development in this field.

Development of the Maternity and Child Welfare Movement in India

5. The movement started with attempts to train the indigenous *dai* for the practice of better standards of midwifery than those she had been accustomed to practise. The earliest attempt in this direction was made by Miss Hewlett of the Church of England Zenana Mission in 1866. In 1885 the Dufferin Fund Committee was established with the object of providing medical aid to the women of India through women doctors. This Fund, assisted by a small grant from the Government of India, opened the Lady Reading Health School in Delhi in 1918 for the training of health visitors. This was followed by the founding in 1919 of the Lady Chelmsford All-India League for maternity and child welfare. In 1930, under the auspices of the Indian Red Cross Society, a Maternity and Child Welfare Bureau was established for the purpose of promoting maternity and child welfare work throughout the country. The next step was the establishment in 1933 of a

training course in the All-India Institute of Hygiene and Public Health, Calcutta, which qualifies women doctors for a diploma in maternity and child welfare granted by the Faculty of Tropical Medicine and Hygiene, Bengal.

Existing Numbers of Midwives, Health Visitors, Women Doctors and the Probable Numbers required

6. *Midwives.*—The training of midwives preceded in India the training of nurses and it started with the establishment of hospitals about a century ago. There are now about 5,000 practising midwives in the country with approximately 300 qualifying themselves for the profession annually. For a total of probably ten million births each year in British India about 100,000 midwives will be required for providing adequate service to the people, on the basis of one midwife to 100 births. Lack of skilled service by qualified midwives plays an important part in the prevailing high rates of maternal mortality and of infantile deaths in the first month after birth (these form about 45 to 50 per cent. of the total infant mortality in a year). The need for making available, as quickly as possible, an increasing number of this class of trained workers for midwifery service, is therefore urgent. In view of the large difference between the existing number of midwives and that necessary to meet the requirements of the country as well as of the difficulty of producing rapidly fully trained midwives in adequate numbers, the question will have to be seriously considered whether, as an interim measure, the indigenous *dai* cannot be trained and made to work under proper supervision, so as to render her reasonably satisfactory for her duties.

7. *Health visitors.*—The total number of health visitors in the country is about 700 or 750. Since the establishment of the first training school in Delhi other institutions have been started in different parts of the country. There are now seven schools training some 60 pupils annually. It is considered that at least one health visitor will be required to supervise the work of five midwives, if her duties are confined to the supervision of midwifery practice. If the health visitor is to undertake other duties also, such as nursing the sick in the homes of the people (which is what a public health nurse is required to do in other countries) the number necessary for the country as a whole will be much more. Even with her duties restricted to the supervision of midwives about 20,000 health visitors will be required to control the work of 100,000 midwives.

8. *Women doctors.*—The number of women doctors in India, including graduates and licentiates, is not definitely known, but it is believed that their total strength will not exceed 4,000. Of these about a thousand are probably in public service, while another thousand are not, for various reasons, practising the profession. The remaining 2,000 are, it is believed, in general practice. The large majority of those who are in public service and in private practice are working in urban areas, particularly in the larger towns and cities. Even in these urban areas the number of medical women available is not sufficient to provide

adequate medical relief for women and children, while in rural areas the position is much worse. Turning to preventive health work for these sections of the population, which maternity and child welfare organisations are intended to provide, we find that the total number of women doctors with special training in this branch of health administration is only about a dozen medical graduates and about 50 or 60 licentiates. Another eight graduates are expected to complete such training by April 1946. The licentiates have had, generally speaking, only short courses in maternity and child welfare work, while the women graduates have had the full training for the diploma in the subject.

9. In most parts of the country maternity and child welfare centres are run by health visitors. Madras and Delhi are the only provinces in which women doctors are employed in this organisation in both urban and rural areas. In certain provinces even the supervision of this service, which is manned by health visitors, is carried out by medical women without any special training in maternity and child welfare work.

10. The proper development of antenatal, intra-natal and post-natal care of women will require the employment of women doctors in sufficient numbers in the maternity and child welfare organisation. In the circumstances described above it will be seen that the existing level of maternity and child welfare work in the country as a whole must be of a very low standard. Our proposals to expand this important service as part of the future health programme will necessitate the training of large numbers of women as doctors as well as their specialisation, later, in this branch of health work.

11. The present position as regards this health service may be broadly summarised as follows:—

(*a*) Madras is the one province in which an effort has been made to organise maternity and child welfare work on systematic lines, although specially trained medical women devoting their whole time to the development of maternity and child welfare work exist in the provinces of Bengal, the United Provinces and Orissa. It is understood that, in the Punjab also, a woman doctor has recently been appointed on the staff of the Director of Public Health to promote the development of this activity in the province as a whole. This lady has not had, it is understood, any special training in maternity and child welfare work.

The following is the summary of the work carried out in 1942 in the province of Madras:—

Fourteen district boards and 32 municipalities maintained 225 centres, which employed 51 women medical officers, 32 health visitors and 422 midwives. The total expenditure was 3·31 lakhs. It should be mentioned that, although a much larger number of medical women are employed in this organisation

in Madras than in other provinces, they are mostly licentiates and have had only a short course of special training in the subject. 7,900 clinics were held, 53,100 deliveries were attended to by qualified midwives and a total of about a million home visits was paid by the different categories of workers together. It seems unnecessary to go into the details of maternity and child welfare work in other provinces when only about three per cent. of the total births could be reached by the organisation even in Madras, where the service has been best developed.

(*b*) Dai training under the Victoria Memorial Scholarships scheme has generally proved unsatisfactory. Probably the chief reason is lack of supervision of their work after training.

(*c*) The main defect in midwife training is the general absence of experience in domiciliary work.

(*d*) The level of training in health visitors' schools is, with the exception of Lady Reading School, generally of a low standard, particularly in respect of practical training.

(*e*) The general absence of either provincial or municipal organisations to which maternity and child welfare officers might be recruited has resulted in few candidates offering themselves for training for the diploma in maternity and child welfare. Such candidates as do take up the course are deficient in training in both preventive and clinical pediatrics and in preventive obstetrics.

CHAPTER VII

HEALTH SERVICES FOR SCHOOL CHILDREN

1. The aims and objects of a school health service include the provision of adequate health protection to school children and the inculcation of the hygienic mode of life in them. A school health organisation should provide for:—

(1) the maintenance of a high standard of environmental hygiene in schools;

(2) adequate health protection to the children, based on periodical physical examinations, correction of defects and preventive work, including prophylactic inoculations, where necessary, and follow-up in the homes of the pupils;

(3) health education so as to enable the child to learn and practise personal hygiene;

(4) correction of defects of nutrition through a properly balanced midday meal and

(5) physical education by gymnastic exercises and corporate recreational activities.

Adequate nutrition and physical education are so important not only from the point of correcting existing defects in the child but also from that of endowing him with an abundance of health and vigour and with the power to enjoy life that no school health programme can be considered satisfactory without including these within its scope. In India school health services do not exist in most parts of the country and even where they exist, the organisations are not, at present, functioning on the comprehensive lines indicated here.

Development of School Health Administration in India*

2. School medical inspection was started first in Baroda city in 1909. In the succeeding years practically every province introduced some form of school health programme but the area covered by the service varies widely as well as the types of schools in which medical inspection is carried out. The schemes seem to cater more for middle and high schools than for primary schools. The Joint Committee of the Central Advisory Boards of Health and Education drew special attention to the frequency with which a system of medical inspection was started in the Provinces, only to be abandoned after a short while as a measure of economy. There are a number of instances of change in policy which seem to indicate that there has not been a clear appreciation of the fundamental necessity for, and of the essential characteristics of, a school medical scheme calculated to promote the health of the school child. The Committee emphasised that satisfactory arrangements for school medical inspection and treatment should form an essential part of any efficient system of public education. The conclusion reached in the report was that, with certain exceptions, school

* These brief notes on the development of school health services in India are based on the information contained in the Report on School Medical Inspection of the Joint Committee of the Central Advisory Boards of Health and Education (1941).

health work in British India is carried on in a perfunctory manner. Environmental hygiene is striking in its absence, particularly in the rural areas. Medical inspection is undertaken with inadequate provision, in many cases, for the treatment of the defects which are detected and with even less provision for preventive work through a follow-up service. Health education has produced little tangible results.

Brief descriptions of school health work in a number of provinces are given below:—

3. *The United Provinces.*—The medical staff employed on school health activities consist of (1) medical officers with public health qualifications, who are employed on school health work alone, in 13 of the larger towns in the province and (2) district and municipal medical officers of health in other parts of the province, who do this work along with their other duties. Two types of inspection, based on a difference in the degree of thoroughness, are being carried out. They are (*a*) " ordinary " for vernacular middle and primary schools in urban and rural areas and (*b*) " detailed " in English High and Middle Schools, English Normal Schools and Intermediate Colleges. In 1943, as regards (*a*) mentioned above, of 596 institutions under the scheme 248 were visited by the school medical officers and medical inspection was carried out in respect of about a fifth of the total of 72,600 pupils on the rolls. In rural areas, about a fifth of the total number of 10,597 schools was visited and approximately one-seventh of the 736,300 pupils on the rolls was examined. As regards treatment facilities, a central clinic has been established in each of the 13 towns where whole time school medical officers are employed. At these clinics treatment is given by the school medical officers for simple ailments and defects found during their inspections. In a certain number of places the free services of specialists have been secured for ophthalmic and dental cases. The total expenditure of Rs. 30,000 per annum on these clinics is met by a charge of one anna per month recovered along with his fees from each pupil in the institutions under the scheme. A portion of this expenditure is earmarked for the free supply of glasses to poor students and of milk to ill-nourished children who are unable to pay for it. In other urban centres provision for treatment is restricted to the supply of a stock of simple medicines to the schools concerned for administration by the medical officer of health during his inspection or under his advice by the teachers. The position regarding treatment is even worse in rural areas where the existing dispensaries are situated at great distances from one another. Even here, however, some provision is made for elementary medical needs by the supply of first-aid equipment to schools through the Junior Red Cross Organisation.

4. *Bengal.*—In this province an Assistant Director of Public Health devotes his whole time to this branch of health administration. Since 1928 a scheme of school medical inspection has been in existence in Calcutta city. This scheme extends to all Government and Government-aided secondary schools in the city with

approximately 10,000 pupils. Four school medical officers are employed on this scheme. Provision for the treatment of the defects discovered during medical inspection is meagre. An annual sum of about Rs. 650 is available for the purchase of all the appliances required and of drugs and an additional sum of Rs. 300 per year for the free supply of spectacles to poor students.

As regards other towns it is stated that, in the 29 municipalities out of a total of 117, which employ health officers, school medical inspection is also done by these officers as part of their routine duties. Similarly in the areas of three district boards the District Health Officers are said to perform this work also in addition to other duties. No special provision seems to exist for giving treatment to the pupils in whom defects and disabilities are discovered.

5. *The Punjab.*—In the rural areas there are five selected districts in which centres within a radius of two miles from a dispensary come under a scheme of school health service. The scheme, which is in its infancy, is far from elaborate. In some of the larger urban areas in the province, schools have combined to engage a whole-time doctor who conducts medical inspections and carries out treatment. These schemes are self-supporting, students from the fifth class upwards contributing a medical fee of Rs. 1-8 per annum per head. The teachers are also included in the scheme and they contribute Rs. 3 each, per annum. In a few of the smaller towns in the Punjab students of the secondary schools pay two annas per month and in return are examined once a year and receive a certain amount of medical attention.

6. *Delhi Province.*—In New Delhi the school medical service covers a population of about 4,000 students. The scheme is under the control of the Chief Health Officer, who has a man and a woman doctor to look after the schools for boys and girls respectively. The New Delhi municipality also employs a dentist and an occulist on a part-time basis for providing these services to the school children. Treatment for minor ailments is provided. A part of the cost is recovered from the pupils by charging them a fee of two annas per month and the share of the municipality towards the cost of the scheme is about Rs. 8,000 annually. In Delhi city two school medical officers, who are servants of the Provincial Administration, are employed. They are controlled by the Chief Health Officer. The service is not so well organised as in New Delhi.

7. *Madras.*—In Madras City there are four full-time medical inspectors, two medical inspectresses and two part-time specialists to work in school clinics. There are also special clinics for ear, nose and throat cases while those suffering from eye and dental affections are referred to the local hospitals. Outside Madras City there is no school medical inspection service except in certain schools where the authorities concerned have introduced such inspection.

8. We do not propose to describe the school health services in other provinces because they present no material differences from the organisations we have outlined above.

9. Before we close this chapter we shall refer to two other aspects of the school health problem. The first is the nutrition of school children. The Joint Committee's report, to which we have referred above, has pointed out that " In many parts of India it is the custom for children to have a meal before they leave for school and have no more food until they return home in the late afternoon. Such children cannot be expected to have the necessary energy to devote themselves to their school tasks. It is essential, both from the point of view of education and of health, that all the children should be given a midday meal, whether it is brought by the children from their homes or provided at the school by the authorities ". We fully endorse this view. We find from this report that, in certain of the provinces in which school health services have been operating, the authorities concerned have realised the value of a midday meal for school children and that, of the total expenditure on school health services, a high proportion is set apart for school meals. Examples are Madras city with a provision of Rs. 67,000 for supplementary food and an allotment of Rs. 12,000 for the school medical staff, and Bengal with a provision of Rs. 45,000 for food and Rs. 7,800 for medical inspection and treatment. The growing child is particularly susceptible to the adverse effects of malnutrition and under-nutrition and no school health scheme can be considered satisfactory unless the provision of a balanced midday meal forms part of the scheme.

10. The other aspect of the school health problem is the existing low standard of sanitation in many schools, particularly in the rural areas. Even those schools which are housed in buildings constructed for the purpose do not, in many cases, conform to modern standards. A large number of schools are housed, however, especially in rural areas, in rented buildings in which the sanitary condition, the arrangement of the class rooms as regards lighting and ventilation and the provision of proper lavatory and washing facilities, all leave much to be desired. The theoretical instruction regarding personal hygiene, which is given to the students in the class room, must necessarily fail to influence their life in the absence of these essential facilities to enable them to practise what they are taught.

CHAPTER VIII.

HEALTH OF THE INDUSTRIAL WORKER.

Definition of Industrial Population

1. Before beginning to discuss the health problems of industrial workers it is desirable to consider what sections of the community should be included within this category. The conditions affecting the health of a worker may, broadly speaking, be divided into two groups, namely, those which he shares with the other members of the general community among whom he lives and those which are associated with the occupation he pursues. In regard to the latter there may be special hazards to health arising out of particular occupations. The development of anthrax by those handling wool or skins and hides or poisoning by lead, chrome and other substances which are used in a variety of trades or manufacturing processes are examples of such special hazards. There are also other factors which have their influence on the health of the worker and these include the lighting, ventilation and general sanitation of the workshop or factory, the dust and noise associated with the working environment and the provision that exists for rest pauses, meals and personal cleanliness. It seems correct to hold that, over and above the general provision for health protection which the worker can share with the other members of the population, he has the right to claim that special measures should be taken to counteract the adverse effects of those factors which are associated with his occupation. The provision of such special health measures is the function of an industrial or occupational health service. We believe that, to a greater or less extent, all those who are gainfully employed outside their own homes will require the services of the occupational health organisation. While recognising this as the ultimate objective we consider that, as an interim measure, the term, " Industrial population ", may with advantage be limited to the classes shown below:—

Persons employed in—

1. establishments governed by the Factories Act;
2. unregulated factories;
3. mines;
4. the building industry;
5. large public works;
6. transport organisations including railways, roads, inland waterways, high seas and docks;
7. plantations, tea, rubber, coffee, sugarcane and cinchona;
8. distributive trades including retail shops and
9. restaurants and hotels.

An Estimate of the Probable Number of Industrial Workers

2. The number of workers in certain of the classes shown above is not known. Such information as is available is given below.

The average daily number of workers, in 1942, in various types of establishments governed by the Factories Act, are quoted from a Government return:—

	Perennial.	Seasonal.
Government and Local Fund factories	299,273	620
All other factories—		
Textile	965,459	...
Engineering	223,820	...
Minerals and Metals	82,493	...
Food, Drink and Tobacco	121,311	162,317
Chemicals and Dyes	72,626	1,507
Paper and Printing	48,501	...
Wood, Stone and Glass	82,334	...
Gins and Presses	17,029	134,670
Skins and Hides	29,608	...
Miscellaneous	38,465	2,204
TOTAL	1,980,919	301,318
GRAND TOTAL	2,282,237	

It has not been possible for us to obtain estimates of the number of persons employed in certain occupations. These include workers in unregulated factories, the building trade, large public works, inland waterways, docks, motor road transport, sugarcane and cinchona plantations, retail shops, restaurants and hotels. Such figures as we have been able to secure are given below:—

1. Transport workers—		
(*a*) Railways	771,380	
(*b*) Tramways—		
(i) Calcutta	6,000	
(ii) Bombay	4,000	
2. Indian seamen	92,900	(latest figure available is for 1929 in Bengal and Bombay).
3. Tea	588,163	(Assam).
	196,899	(Bengal).
	930,412	(South India).
4. Rubber	48,704	
5. Coffee	92,504	(South India)

The figures quoted above for factory workers and others give a total of a little over 5 millions and if those categories of workers, for whom no estimates of possible numbers could be made, are also included, the total industrial population as defined by us is likely to be in the neighbourhood of at least 7 or 8 millions, if not more.

Certain Preliminary Considerations

3. While industrial workers all over the world require special health measures for reasons we have already indicated, we believe that, in India, the need for protecting the health of this section of the community is even greater. In the highly industrialised countries of the West the industrial population is more stable than in India. The industrial worker in India, on the other hand, is generally a migrant from the rural areas and continues to keep contact with his home. He lives and works in a more congested and unhealthy environment than that to which he had been accustomed. He often lives separately from his family and exposed to the temptations that urban conditions provide. The incidence of disease is therefore high among these workers and the continuous exchange of industrial population, which takes place between the large urban centres, where industries generally exist, and the rural areas, has already been recognised as a fruitful source of the spread of infectious diseases such as tuberculosis and leprosy. In the urban areas themselves the existing conditions of overcrowding and insanitation are largely associated with the influx of industrial workers, who live widely dispersed among the general population. A high incidence of disease in the former has therefore its repercussion on the health of the community both in industrial areas and in the villages.

4. The war has aggravated the previous conditions of overcrowding in all industrial areas. For instance, the population of Cawnpore was at the 1941 census about 487,000. In October 1944, when we visited the city, we were told that its inhabitants numbered approximately 800,000. A similar abnormal rise in population has been reported from Calcutta, Bombay and other industrial centres. The result has been to produce overcrowding on an unprecedented scale, as the increase in housing accommodation has fallen far short of the rise in population. We draw special attention to this state of affairs because a possible result of further development of industry in the post-war period may be to aggravate existing conditions of overcrowding, unless adequate measures can be undertaken to safeguard against such a possibility. Minimum standards for housing, which would ensure the health of the workers, will have to be laid down. We are confident that the enforcement of these standards is not likely to arouse any great opposition. Indeed, enlightened industrialists have repeatedly expressed before us the view that they would welcome the laying down of such standards. We shall deal with overcrowding in greater detail, later in this chapter, in the section relating to housing.

We shall now take up, for brief consideration, the different aspects of the industrial health problem.

Morbidity and Mortality among Industrial Workers

5. No reliable figures of morbidity and mortality among industrial workers are available. The machinery for providing such information does not exist at present. Many factories have no dispensaries and hence a reliable record covering all industrial

workers cannot be had. Further, the information available from such industrial establishments as maintain dispensaries or hospitals is incomplete. Reasonably complete morbidity statistics are likely to develop only if there be health insurance for the workers, which provides for the certification of sickness before they become eligible for cash benefit. Such a scheme is, broadly speaking, non-existent in the country. The deaths among industrial workers are included in those for the community as a whole and are not shown separately in the statistics which the authorities publish. In the circumstances we do not propose to put forward certain figures which came to our notice.

6. Living in the midst of the general population industrial workers are subject to those diseases which are prevalent among the former. In addition they are also subject to other causes of morbidity and mortality associated with their occupations, particularly those which are of a hazardous nature. As regards general diseases, their prevalence among industrial workers must at least be as high as in the population as a whole. For reasons to which we have already referred we think it probable that the incidence of certain of these diseases might even be higher among industrial workers, particularly of tuberculosis, bronchitis and asthma.

7. Little information is available regarding the incidence of occupational diseases in India. In England medical practitioners are required to notify, under Section 73 of the Factory and Workshop Act, 1901, certain diseases contracted in a factory or workshop. In India, no such provision exists under the Factories Act. Anthrax is notifiable under the local Self-Government Acts in certain provinces, although not as an industrial disease. But no statistics relating to its incidence are available. Under the Workmen's Compensation Act a list of diseases has been declared to be occupational diseases. Compensation is payable by the employer to a workman if he has been continuously in employment for a period of not less than six months and has contracted any of these diseases during that period. The number of claims made in a year is, however, very small—probably less than 10—so that these figures give no indication as to the probable incidence of industrial diseases.

Medical Relief

8. *Provision inside the factory.*—The Factories Act enables Provincial Governments to make it obligatory on an industrial establishment to make provision for first aid. We are satisfied that the first aid arrangements provided by the great majority of the factories come up to the standard laid down by the Factories Act. As regards dispensaries run by industrial establishments, with some exceptions, the position is not so satisfactory. Drugs and equipment are, in the majority of these dispensaries, in short supply. There was a general complaint of shortage of quinine, particularly in Bengal, Bihar and the United Provinces.

9. *Provision outside the factory.*—The general conclusion that we have reached as the result of our survey of the total provision

for medical relief outside the factory for industrial workers by Governments, local bodies, employers and private practitioners is that the existing facilities must be considered to be, on the whole, quite inadequate.

10. The facilities provided by Provincial Governments and local bodies for industrial workers are, generally speaking, those available for the community as a whole. The grave insufficiency of such provision for the community has been pointed out, in some detail, in Chapter III of this volume of the report. Large industrial centres are either large cities or are in close association with them. In such places the provision for medical relief may be expected to be higher than that for the country as a whole. Nevertheless, the existing facilities are inadequate to meet the requirements of the workers. We may illustrate this by a brief reference to three industrial centres Ahmedabad, Cawnpore and the Hooghly industrial area. The population of Ahmedabad at the 1941 census was nearly 600,000. It is certain that this population must have increased considerably in the succeeding years, although we are not in a position to estimate the rise. The total number of hospital beds available in Ahmedabad is 380. There are some 350 men and 25 women medical practitioners. An out-patients dispensary is run by the Textile Labour Association of Ahmedabad. These facilities may be considered to be better than those which exist in some other towns. But, considering the size and needs of this large city, the total provision for medical aid seems to be quite inadequate. In Cawnpore the Provincial Government maintains a general hospital and a women's hospital. Factory employers, under a combined scheme, run the McRobert Gunj Hospital for mill assistants only, *i.e.*, upper class factory workers. In addition there is an American Mission Hospital for women and children. The total number of medical practitioners in the city is about 100. The Medical Officer of Health, Cawnpore, states that the available medical facilities were insufficient for the inhabitants of the city with its normal population of two to three hundred thousand, which has increased to 800,000 owing to the influx of labour under war conditions, while the provision for medical aid has remained the same. As regards the Hooghly industrial area the Chief Inspector of Factories, Bengal, stated that " medical relief whether by way of institutions provided by Government or otherwise, or private medical practitioners, is inadequate to meet the needs of both the general and industrial communities. Staff, equipment and drugs are also inadequate."

11. It must be pointed out that, although we have included the general practitioners in each area as part of the provision for medical relief, a large proportion of industrial workers is unable to pay for and obtain the services of such practitioners. They must depend mainly on the out-patient and in-patient departments of hospitals and on the dispensaries maintained by the public authority or on institutions provided by employers.

12. Special reference is necessary to medical facilities in plantations and mining areas. From the evidence we received and from our own observations the existing provision in plantation areas leaves much to be desired. The dispensaries maintained in two plantations which we visited in South India were of a low standard. One of these was in charge of a homeopathic doctor and stocked homeopathic drugs as well as those used in modern scientific medicine. Both dispensaries were small in size and the standard of cleanliness was definitely low. Conditions in the Dooars plantations in Bengal cannot be said to be better.

13. At the same time reference should also be made to better conditions elsewhere. From information received from the Secretary of the Planters' Association of South India, the planta tion districts of the Anamalais, Nilgiris Wynaad, South Nilgiris, Travancore and Central Kanan Devans together have an area of 250,000 acres and employ about 200,000 labourers. The total hospital accommodation available in the area is 1,270 beds in 81 hospitals. This cannot be considered as an insufficient provision as it represents 6 beds per 1,000 of the population, which is about 25 times that which is now available for the general population in the country as a whole. In some of the larger hospitals graduates in medicine are employed, while the smaller plantations utilise the services of medical licentiates. In the Nilgiris, however, some plantations have even compounders in charge of their medical institutions.

14. Provision for medical relief in the coal-mines of Raniganj, Asansol and Dhanbad are not, speaking generally, satisfactory. We noted that some collieries employed medical licentiates, on a part-time basis, for Rs. 15 or Rs. 20 per month. This is the salary of a peon and it does not seem unreasonable to expect that the service which the miners would receive for such salaries would be comparable in value.

Rehabilitation

15. This important aspect of medical relief for workers has hardly been developed in the country. We did not find, during our tours, in any industrial area a centre which undertakes the rehabilitation and retraining of the worker, so as to enable him to take up work again after he had been disabled by an accident. Provision for the supply of artificial limbs and artificial eyes is also quite inadequate.

Accidents

16. The rules relating to accidents, which have been framed by Provincial Governments under the provisions of the Factories Act, appear to be adequate and they are, generally speaking, followed by most of the larger concerns. There is, however, evidence to show that some of the smaller establishments try to evade the notification of accidents.

17. Accidents are classified as fatal, serious and minor. The following figures for the total number of accidents in British India relate to the year 1942:—

Fatal	323
Serious	9,111
Minor	44,740
TOTAL	54,174

18. In those factories in which dispensaries and hospitals exist, the treatment of patients is undertaken at these institutions. Where such provision is not available the cases are sent to local public institutions. Very few factories possess their own ambulances. Many utilise the factory lorry or car. In several instances it was reported to us that workers had to make their own arrangements for conveyance to hospital.

19. Abolition of the defence of common employments makes employers responsible for compensation in many cases of accidents. This probably leads to reluctance to notify accidents in the case of certain employers. But we have reason to think that, with the growth of the trade union movement, workers are becoming better organised and more conscious of their rights. It has not been possible for us to examine in detail the working of the Workmen's Compensation Act. Reference should, however, be made to the representation received by us from certain organisations that cases under the Act have a tendency to drag on in some provinces in which Compensation Courts sit only twice a year. Some industrial establishments have insured themselves against the claims of workmen for compensation and no difficulty arises in such cases for the payment of compensation. In other establishments disputes between employers and employees are not uncommon. These disputes are settled in the Court of the Commissioner for Workmen's Compensation or by the District Magistrates who are Commissioners for this purpose in their districts. The trend of evidence is that, in the majority of cases, the claim of the worker is upheld by the Court. It has been represented to us that, on certain occasions the amount of compensation sanctioned is inadequate, for instance, a sum of Rs. 900 for the loss of a right arm.

20. We believe that there is a case for a simplification of the procedure laid down in the Workmen's Compensation Act and that this question deserves early consideration.

Sanitation, Lighting and Ventilation of Factories

21. Legal provision for ensuring the health and safety of the worker has been made in Chapter III of the Factories Act. Section 13 of the Act lays down that " every factory shall be kept clean and free from effluvia arising from any drain, privy or other nuisance and shall be cleansed at such time and by such methods as may be prescribed ". We consider it essential that such Provincial Governments as have not framed rules under this section should do so without delay, because, from the point of view of the health

of the worker, it is necessary that certain minimum standards of cleanliness inside the factory should be laid down and enforced.

22. Under Section 14, the Provincial Government has the power to prescribe that every factory shall be ventilated in accordance with such standards and by such methods as may be prescribed. We understand that rules under this head have been framed by every Provincial Government except that of the Punjab and the evidence before us suggests that the observance of these rules is reasonably satisfactory.

23. In some of the textile mills workers complained that humidification was overdone to such an extent as to interfere with comfortable working conditions, it being stressed by some of the workers' representatives that such increase in moisture was made by factories using the cheaper quality of yarn in order to prevent their frequent breakages. This is a matter for expert investigation.

24. Progress has been made for protection against dust in the large textile industries, but the position in jute mills is unsatisfactory. Dust was in evidence in the blow rooms and in the bleaching departments. Similarly, in cement factories in Southern India, there was considerable evidence of dust in the crushing mill and in the packing departments. In some of the places we visited the workers were found protecting their nostrils by tying the end of their turbans round their nose. In no place did we notice that the workers were provided with masks.

25. Section 15 of the Act, which deals with cooling arrangement in factories, has worked reasonably satisfactorily in the factories which we visited. In some of the factories we found that effective air-conditioning devices have been installed. Air-conditioning, besides ensuring higher efficiency and aiding in the manufacturing processes, contributes much to the comfort and well-being of the workers.

Drinking Water Supply

26. The provision of water supply in factories is regulated by section 19 of the Act. We found that, in some factories, workers had to walk long distances for drinking water. In certain cases drinking water supplies were kept not far from latrines. In some establishments we noted that the salary of the waterman had to be paid by the employees. We are particularly drawing attention to such matters because we consider that it should be obligatory on all owners of factories to provide, free of charge, safe and cool drinking water in adequate quantities to their workers and that it should be readily accessible to them.

Personal Cleanliness of the Workers

27. Washing and cleansing facilities cannot be considered adequate in many industrial establishments we visited. This remark applies particularly to the mining industry. It may, however, be mentioned that the Tata Coal Mines, Dhanbad, provide

reasonably adequate arrangements for these purposes and their example may, with advantage, be followed by other establishments.

Special Clothing and Protection of the Eye of the Worker

28. The provision of special clothing in certain occupations is of great importance. The attitude of the representatives of trade unions, who appeared before us, was that they would welcome protective clothing provided it was supplied by factory owners. It was urged that the wages which employees received would not enable them to purchase such clothing even at cost price. The need for such special protective clothing cannot be over-emphasised in the case of those occupations which are likely to soil the clothes of the worker or produce specific risk to his health in the absence of such protection. The Cordite Factory at Coonoor has given a lead in this direction.

29. The wearing of protective eye glasses is not strictly enforced even where employers provide them. We found them hung up on walls in many cases. The chance of foreign bodies getting into the eyes is not negligible in certain occupations. The damage done may lead to serious consequences involving, in some cases, loss of sight to the worker and the payment of heavy compensation by the employer. It may be that the disinclination of the employees to use glasses is due to their unsuitable design, in as much as they are, in the majority of cases, of the closed goggle-type with no ventilation to the eye.

Urinals and Latrines

30. Rules made by the Governments of Bombay and Madras under the provisions of the Factories Act require that factory owners should provide one seat for every 50 workers where the total number of employees exceeds 200. We have no information as to what standards have been prescribed by other provinces.

31. We were particularly struck by the absence of urinals and latrines in coal-mines. We were informed that miners used the goafs and unused galleries as latrines and that sweepers went round cleaning them. The inaccessibility of some of these places and the darkness that prevails in them make it doubtful whether proper cleaning will ever be carried out. The incidence of hook-worm infestation among the mining population, as shown in a report of the Asansol Mines Board of Health, appears to be high. Among colliery workers the percentage of infestation was 68·8, while the corresponding percentages for the rural and town populations were only 37·1 and 18·6 respectively. The Royal Commission on Labour commented adversely on the sanitary conditions that existed underground in the coal-mines and recommended that bucket latrines should be provided at convenient spots and a suitable staff of sweepers employed to keep the latrines clean. This recommendation has not been carried out and the conditions that prevail are much the same as those on which the Royal Commission commented.

Housing

32. By far the most important matter that we have had to consider in connection with the health of the industrial worker is the housing problem. We are not satisfied with the housing conditions prevailing in any of the places we visited. Overcrowding is a feature common to all these centres. Further, the hygienic condition of the houses and their surroundings is, in most cases, very unsatisfactory. Certain recent figures presented by the Chief Engineer of the Calcutta Corporation show that 27 per cent. of the population in that city live in *bustees*. Yet, under the existing City Municipal Act, land owners are responsible for the sanitary and hygienic conditions in them! The Bihar Labour Enquiry Committee report of 1940 made strong remarks about the housing of labour in industries adjacent to or within the limits of municipalities or even in rural areas. The report of the Rent Enquiry Committee of the Bombay Government shows that, some years ago, in Ahmedabad there was already a deficit of over 20,000 working class tenements. The Textile Labour Enquiry Committee reported that, in Bombay in 1936, the employers provided some 4,000 and odd tenements, three quarters of which were single room habitations, against a working class population of over 150,000. In Ahmedabad less than 3,000 (the majority being single-room tenements) were provided for over 100,000 workers. In the tenements constructed and owned by the Government of Bombay, 63,000 persons in 1939 were housed in 13,000 rooms. An enquiry conducted in 1938 by its Labour Office showed that 91·24 per cent. of the families covered by the enquiry lived in one-room tenements; the average number living in each had arisen in 1941 to 4·01. In 1938, 74 per cent. of the population of Bombay lived in one-room tenements, which constituted 84 per cent. of the total tenements in the city. In the same years, 62 per cent. of the families in Cawnpore and 63 per cent. of the families in Lucknow lived in one-room tenements. In Bengal, at the outbreak of the war, there were only 40,000 one-room tenements for nearly 150,000 workers in the Calcutta and Howrah area. The activities of Improvement Trusts and Municipalities have made little impression upon the housing difficulties of industrial workers, though in some places they have relieved the housing difficulties of the middle-classes.

33. The assumption underlying the majority of working class housing schemes has been in the past that workmen and their families need only single-room tenements. In such quarters the observance of the ordinary decencies of life is impossible. Further, as the room has generally to meet all the requirements of the family, including cooking, living and sleeping, it becomes impossible to keep it reasonably clean and sanitary. The filth and squalour which we saw in the *ahatas* of Cawnpore or the *bustees* of Calcutta are indescribable. A dark dingy room of about 10 ft. by 8 ft. in size, built in such a manner that neither light nor air can enter it and with, as in the case of the coal-mines area, as many as 8 or 10 persons not infrequently living in it, represents the type of living accommodation which workers have to accept in

these congested industrial centres. Washing and bathing facilities as well as latrine accommodation are often non-existent. Indeed, men and women have to go sometimes two or three furlongs in muddy roads and without light to answer the calls of nature. The inconvenience they have to undergo is aggravated during rains. We have taken Cawnpore and Calcutta as examples. The position is no better in other large industrial cities such as Bombay, Ahmedabad, Madura and Coimbatore. In the plantations we were shown quarters into which we could enter only by crawling. In the coal-mines area housing conditions are equally unsatisfactory.

34. As against this dark picture reference must be made to the efforts that certain enlightened employers have made to ameliorate the housing condition of their workers. We particularly desire to mention, in terms of appreciation, the housing scheme for workers which the Madura mills have started. In Harveypatti we saw spacious grounds, detached quarters with two rooms 10 ft. by 10 ft., a verandah, a court-yard, a separate latrine, bathing place, a garden and a small plot where flowers and vegetables could be grown. The houses are built by the company but a worker can acquire proprietary rights over it after paying a rent of Rs. 4 per month for a period of 12 years. Some other employers have also attempted to solve, at least partially the housing difficulties of their workers by providing quarters for them. In this connection reference may be made to some of the places visited by us, the Delhi Cloth Mills, Ltd., and the Birla Mills at Delhi the Tatas and the Indian Steel and Wire Products at Jamshedpur, the Batas and some of the Jute Mills in the Calcutta industrial area, the Spring Mills in Bombay, the British Indian Corporation and the Begg Sutherland group in Cawnpore. Some of these housing schemes are good, some of indifferent quality while others are unsatisfactory. We noticed a desire on the part of employers to help in the solution of the housing problem, but their main grievance was that neither sites nor building materials were available in war-time. Employers cannot, even in the post-war period, carry out any large scale housing programme for their workers unless they are helped to secure sites for building purposes. In this connection the question of such legislative and administrative action as may be necessary has been considered in Volume II which deals with our recommendations.

Nutrition of the Worker

35. The diet of workers in factories, mines and plantations is generally of a low standard and lacks the essential nutritive elements. We were particularly struck with the low quality of the staple diet of workers in Madras and Bengal. The position in regard to milk consumption is unsatisfactory in all parts of the country. The average level of wages in Bombay and Ahmedabad is higher than in other places and, from the evidence we collected, we have reason to believe that a more nutritive diet is taken by workers in these two cities than in other parts of India.

36. In the Province of Madras and in Jamshedpur an effort has been made to encourage workers to take meals at regular hours. The provision of facilities by way of canteens inside the factory and a system of proper rest pauses should go a long way to change the present irregular habits, in the case of many workers, in respect of time of meals. We saw an excellent canteen in Arvind Mills in Bombay and another at the Century Mills. In both places the arrangements for serving food to the workers were satisfactory. Seating accommodation for each person was provided separately and food was served in *thals* on neat little tables. The cost of a full meal at the Century Mills was said to be As. 2-9. The Tata Iron and Steel Co., Jamshedpur, maintains canteens and hotels at which excellent meals, much below the prices in the local bazaar, are served. Another good canteen we visited was the one run by the Radhakrishna Mills at Coimbatore. Bombay seems to have given the lead in this matter to the rest of the country and we understand that there are some 113 canteens in the Province, 16 of them suppplying cooked food while the majority serve tea and refreshments only. The textile industry runs 85 of these canteens. In Madras, Bengal and Northern India, we were told by many employers and some employees that the social habits of the people and their caste prejudices are impediments to the development of the canteen system. But caste prejudices are gradually dying out. While it may be necessary to make separate provision for orthodox and unorthodox workers in the beginning, we have little doubt that, in due course, these prejudices will disappear. In fact the development of the canteen system may have a salutory effect in this direction.

37. In some of the factories we visited co-operative stores and societies were in existence. The Cordite Factory, Coonoor, the Madura Mills and the Arvind Mills have well organised co-operative Stores. At the Cordite Factory Stores fresh vegetables and fruits were available to the workers. The development of co-operative stores and of the co-operative movement among workers requires fostering.

Hours of Work

38. We realise that there is an economic aspect to the question of regulating the hours of work and we do not feel confident to speak with authority on this subject. But there is also a health aspect which we cannot ignore. The number of hours an individual is called upon to work has a bearing on his health. Long hours lead to fatigue which, if continued from day to day, injures the health of the employee, reduces his working capacity and increases his liability to accidents. The Factories Act of 1934 has laid down maximum hours, under normal conditions, for perennial factories as 54 hours per week and for seasonal factories 60 hours. The principle of a 48-hour week was accepted by the Washington Convention in 1921. In recent years the tendency has been to stress the need for an even smaller figure. Before the war the United States and France were, generally speaking, working 40

hours per week. In Great Britain the Factories Act merely prescribes hours of work for women and children and leaves those affecting men to be regulated by collective bargaining. Effective trade union organisations have helped the employees to achieve, for all practical purposes, a 45-hour week in Great Britain. The question for consideration is whether, in the interest of the health of the Indian worker, a reduction in the prescribed hours of work is desirable. He has, generally speaking, a poor physique. His standard of nutrition is low. He has no clean surroundings to live in. These are matters which should be taken into consideration in arriving at a decision as to whether the longer hours prescribed in India as compared with those laid down in the countries mentioned above, are justified from the point of view of the health of the worker.

We must record that enlightened employers are in favour of shorter hours of work, and in our recommendations we have, taking into consideration the health point of view, made a specific suggestion that a forty-five hour week should be adopted.

Transport

39. Transport facilities for workers were reported to be inadequate in almost all the centres we visited. Workers who live at a distance have to walk as many as four or five miles to and from work. When it is remembered that the Indian labourer has to work in perennial factories 54 hours a week and in seasonal factories 60 hours, it will be seen that the question of transport assumes considerable importance from the point of view of his health. The long hours he has to work and the distance he has, in many cases, to walk to and from the place of work would result in fatigue, which must have its adverse effect on his health and efficiency. The question of transport is intimately connected with that of housing. While in some of the smaller places it may be possible to provide working class quarters in areas not too far from the factories, such provision has to be ruled out in the case of large cities like Bombay, Calcutta, Ahmedabad and Cawnpore. In these towns new housing schemes can obviously be undertaken only in suburban areas situated at considerable distances from the factories. In these circumstances the provision of cheap transport is essential. The extent to which transport facilities should be provided is a matter for local investigation.

Rest Shelters

40. Rest shelters, where they were provided, were found to be, in almost all cases, sheds with corrugated iron roofs and with cement or brick floor. We do not approve of such roofing material, which will become heated up in the summer. Many employers said that, in factories which have open space and shady trees, workers prefer to rest during certain periods of the year in the open under the trees. It must be remembered that the sun in the summer is hot in most parts of this country and that workers need and appreciate protection against sun and rain. It is undesirable,

from the point of view of their health, that workers should be allowed to remain inside the factory during rest hours. We saw in several factories workers sleeping inside steel boxes meant for the storage of bobbins. In some places we noticed them taking their meals near their machines on bales of cloth or seated amidst dirty surroundings. The plea that workers hesitate to use rest shelters for taking food on account of caste prejudices is not convincing. If rest shelters are provided, workers will find their own favourite spots and will form their own little groups in the same manner in which the better classes form groups in their clubs.

Drink and Drug Habits

41. The prevalence of drink and drug habits varies from province to province and in the different industrial areas in the same province. An analysis of the evidence available to us shows that these habits may be described as excessive in eight industrial centres, moderate in four, decreasing in six and on the increase in five centres. The question of restricting the use of alcohol by industrial workers will have to be considered both from the point of view of its direct effect on the health of the worker and from that of preventing, as far as possible, the diversion of a portion of his meagre resources from essentials such as food, clothing and shelter for himself and his dependents to intoxicant drinks and drugs for the purpose of a temporary sense of well-being and freedom from care.

Women Industrial Workers and Special Provision for them and their Infants

42. We should like to draw special attention to the lack of sufficient facilities for health work among women factory labour and to the inadequacy of the available number of women doctors, nurses and health visitors for work of this nature.

43. The employment of women workers makes it essential that there should be provision for nurseries or creches where their children can be left and given proper food and attention while the mothers are away at work. The Indian Factories Act has empowered Provincial Governments to make rules (*a*) requiring that, in any specified factory where more than 50 women are ordinarily employed, a suitable room should be reserved for use by the children of such women, who are below six years of age and (*b*) prescribing the standards of such rooms and the nature of the supervision to be exercised over the children therein. The Government of Bombay have made rules for the provision of creches in factories where 100 women are employed. The Government of Madras has not, so far, made any rules in this connection. The position in regard to the provision of creches is worse in Madras than in Bombay, though there are some good creches in some of the larger mills. The absence of a statutory obligation, however, makes employers indifferent about providing creches. In Bihar provision has now been made for the establishment of creches if the number of women workers in a factory

exceeds 50. In Bengal the provision of creches is not a statutory obligation. Some of the larger concerns, including the jute mills, have, however, voluntarily established them and have also included the supply of milk and supervision for the children. The standards reached by these creches in respect of such provision are not, however, satisfactory. In the United Provinces Section 16 of the Maternity Benefit Act, 1938, gives power to the Provincial Government to make rules for the provision of creches and for their supervision. Rule 11 framed under this Act lays down the standards in regard to creches. Milk for babies and children is provided, free of charge, at these creches. Existing creches in the plantations in the Dooars are not working satisfactorily, the chief defect being absence of arrangements for feeding the children while their mothers are away at work.

44. Maternity Benefit Acts are in existence in all provinces except Bengal, Bihar and Orissa. In the first two, however, we understand that women are receiving maternity benefit in the case of all the larger industrial establishments, including plantations. The maximum period for benefit allowed under the different Provincial Acts four weeks before and four weeks after childbirth. Under the International Labour Convention the period recommended is six weeks in both cases. The grant of maternity benefit is of great importance from the point of view of the health of the mother and of the child. In India infant and maternal mortality rates are high. Therefore the need for giving the woman worker the period of rest regarded as necessary under the International Labour Convention must, in our view, be recognised.

45. We were assured that the enforcement of the Maternity Benefit Acts did not result in any decrease in the number of women employed in the provinces of Madras and Bombay. In order to enable a woman to obtain maternity benefit, certification of her pregnancy is necessary. We are not satisfied with the existing facilities for the certification of pregnancy. Women doctors are not ordinarily employed in dispensaries and industrial areas generally suffer from an acute shortage of them. We understand that some women are reluctant and even definitely object to submit themselves to examination by men doctors.

Factory Inspection

46. The factory inspection staff in the provinces is at present quite inadequate. The Commissioner of Labour in Madras considered that it is not possible for an inspector to do more than 250 inspections satisfactorily in a year. The evidence given before us goes to prove that the factory inspection staffs require strengthening in all the provinces. In our opinion the aim should be to have the staff sufficiently strengthened to ensure the inspection of all factories at least twice a year.

47. One of the questions to which we gave some attention was that of elementary training for factory inspectors in public health. The Chief Inspector of Factories, Bengal, considered that, at the

present stage of industrial development, such training was unnecessary. On the other hand the Chief Inspector of Factories, United Provinces, took a different view. He said that training in public health would enable an inspector to administer more satisfactorily the safety and welfare provisions of the Factories Act. Further, it would make it easier for the factory and public health departments to co-operate in an effective manner. The Government of Madras has recently instituted a three-weeks' course in public health for factory inspectors. While this is to be welcomed, the consensus of opinion among those who expressed their views on the subject was that the period of training should be at least three months.

The Zoning of Industry

48. Industrial towns in India have grown up, in the past, in a haphazard manner and it is common to find factories in areas which are predominently residential. The Madras Public Health Act and the Madras Town Planning Act have recognised the principles of zoning. Legislation in other provinces is not so definite and clear. We learnt from the Director of Public Health, Madras, that his Government has advised local bodies, through executive instructions, to set apart industrial areas and that installation of factories is normally permitted only in such areas. We were also informed by him that the policy of the Madras Government was to discourage local bodies from renewing the licenses of factories already existing in residential areas unless the motive power is electricity. The Madras Public Health Act provides that urban authorities should notify the residential areas within their territory in a period of one year and that no new factories or workshops or workplaces should be permitted to be established in them.

Administration of the Factories Act

49. The Factories Act has given wide discretionary powers to chief inspectors and other inspectors of factories in the matter of instituting prosecutions in cases where there have been infringements of factory rules. In our opinion prosecution should, under such circumstances, be the rule and not an exception. The evidence given before us by inspectors and chief inspectors of factories is that courts are not inclined to impose heavy fines for offences under the Factories Act. While we are not in a position to verify those statements we must record our opinion that violations of the Factories Act and of the rules made under it should not be regarded leniently and that deterrent punishment is necessary in such cases.

Unregulated Factories

50. The Factories Act defines a factory as meaning any premises where 20 or more employees are working or were working on any day of the preceding twelve months and in any part of which a manufacturing process is being carried on with the aid of power or is ordinarily so carried on. Section 5 of the Act gives power to Provincial Governments to make any of the provisions of the Factories Act applicable to factories in which the manufacturing process is being carried on, with or without the use of power,

whenever ten or more workers are working in it, or have worked therein on any day of the preceding twelve months. Further, these Governments have been authorised to apply, by certain amendments carried out in 1940 and 1941, some of the provisions of the Factories Act to small establishments employing less than ten persons, provided a child is employed on the premises and provided also that the establishment conforms in other respects to a small factory. Therefore Provincial Governments can, if they so desire, apply the Act to a large number of small establishments, whether they use motive power or not.

51. Our visits to small factories using power and without it in various parts of the country have convinced us that they require supervision and control. The conditions in the smaller establishments, particularly in the tanning and *bidi* industries and glass and bangle factories in Ferozabad in the United Provinces are indescribably bad. We have seen employees in these places working long hours in extremely unsatisfactory surroundings without the provision of such facilities as adequate light, air and drinking water. Children are freely employed in such establishments. We visited one in Sadar Bazaar in Delhi, where nearly 80 women were working with babies in their arms in a room with insufficient lighting and ventilation. The atmosphere was suffocating. In the same city we also visited the places in which tanners live and work in the Qarol Bagh area. The extent of filth and dirt in these places can hardly be described. Even small children were found working in these tanneries.

52. Some of the industries in which such conditions exist are of long standing and they fulfil a useful place in the economy of the country. They help men and women, who have family traditions in regard to certain trades, to earn a living in a country where the problem of existence is acute for very large sections of the population. The glass works in Moradabad, the silk handloom industry, Benares, and spinning and weaving establishments all over the United Provinces are valuable from an economic point of view and the Provincial Government has rightly followed the policy of encouraging them. We should be sorry if the effect of large scale industrialisation were to eliminate certain handicraft industries for which India has been noted in the past. While fully recognising this we are bound to stress that working and living conditions in many of these establishments require to be radically changed and that they should be brought under reasonable control. The question of devising such control will receive consideration when we put up our recommendations regarding industrial health in the next volume of the report.

CHAPTER IX

PERSONAL HEALTH SERVICES FOR CERTAIN DISEASES.

1. In India there exist all the diseases associated with temperate climates and, with a few exceptions, all those that are associated with the Tropics. For the purpose of this review we have, therefore, limited ourselves to the more important diseases prevalent in the country, which are given below. In dealing with each of them we shall first attempt to make an estimate of their incidence and then describe the measures, legal and administrative, that are in force for their control.

1. Malaria.
2. Tuberculosis.
3. Smallpox
4. Cholera.
5. Plague.
6. Leprosy.
7. Venereal diseases
8. Hookworm disease.
9. Filariasis.
10. Guinea-worm disease.
11. Cancer.
12. Mental diseases and mental deficiency.

Most of these are communicable diseases and, as there are certain common lines of action in respect of them, we shall briefly discuss them first.

2. The local bodies are responsible for health administration in their respective areas, including the control of epidemic diseases. The legal provisions defining their duties and powers in this connection are incorporated in the Self-government Acts which have brought these local authorities into existence. The powers conferred on them for the control of infectious diseases are, broadly speaking, larger in the case of municipal authorities than of rural local bodies. The provisions relate to the notification or the reporting of cases of infectious disease to the local health authority, the segregation and treatment of patients and the carrying out of other measures which are necessary for the prevention of the spread of infection. In addition to the powers contained in the Local Self-government Acts, an all-India enactment, the Epidemic Diseases Act, 1897, provides emergency powers to the different governments, Central and Provincial, in their respective areas of administration, for the promulgation of temporary regulations to deal with an outbreak or a threatened outbreak of infectious disease. Emergency regulations under this Act have generally been issued by Provincial Governments in the presence of widespread outbreaks of epidemics or in connection with certain festivals, which attract large numbers of pilgrims and are therefore associated with the threat of outbreaks of these diseases.

Notification

3. Municipal Acts generally provide that the householder or the medical practitioner, including the Hakim or Vaid attending on a patient, should report to the local authority the outbreak of infectious diseases. As regards the rural areas, in most provinces, the *chowkidar* or the village servant is responsible for reporting such events to the officer in charge of the *thana* or police station, who forwards the information to the local health authority. In the

province of Madras, however, the village headman is responsible for reporting epidemic diseases. In the rural areas the period elapsing between the outbreak of an infectious disease and its notification to a responsible public health official varies in the provinces, the delay being greater in those in which the *chowkidar* and the police department are responsible for this duty.

Segregation and Treatment of Cases of Infectious Diseases

4. In Chapter III of this volume we have already drawn attention to the fact that the existing number of infectious diseases hospitals in the country is small and that the conditions under which they are maintained are, generally speaking, quite unsatisfactory. The total number of permanent beds maintained in the whole country for the treatment of cases of infectious diseases is probably about 1,000, a provision which is far too small to deal with the segregation of the thousands of cases of cholera alone which occur in the country. Moreover, such infectious diseases hospitals as exist are located in the cities and larger towns and facilities for segregation are practically non-existent so far as the vast rural areas are concerned.

5. The provision of adequate isolation facilities to deal with the different infectious diseases prevalent in the country is, under existing conditions, an impossible task. During times of epidemics the number of patients requiring isolation in respect of any one of such diseases as malaria, cholera or smallpox is so large as to be well beyond the capacity of the local authorities concerned. In regard to tuberculosis and leprosy the prolonged period of isolation which is required and the possibility of a relapse into an infective stage, when the patient returns to active life, necessitate for the control of their spread, much more elaborate measures than those required for the common epidemic diseases. In the circumstances the practice of isolation in respect of any of these diseases is, broadly speaking, non-existent in the country as a whole.

Other measures

6. The existing health staffs, even in those provinces in which the public health organisation has been best developed, are quite insufficient to provide adequate service to the large populations entrusted to their charge. In the circumstances the control measures, which are undertaken, are of a limited nature. In the case of cholera, for instance, the action taken includes mass inoculation in order to confer protection against the disease on the affected communities and sterilisation of water supplies. In view of the inadequacy of staff and the large number of patients to deal with, often in widely separated houses particularly in the rural areas, disinfection of infective material can be carried out only in a perfunctory manner, the relatives of the patient being given disinfectants with simple instructions regarding the methods of carrying out sterilisation. Isolation and proper treatment of patients cannot be carried out for reasons which have already been given. As regards smallpox, the one measure that is undertaken is the vaccination of those who are exposed to risk.

MALARIA

7. Malaria is by far the most important disease in all the tropical and subtropical countries of the world. The Malaria Commission of the League of Nations has estimated that 650 millions or about a third of the total population of the world suffer from this disease every year.

8. As regards India, the malaria problem was discussed at length in a health bulletin entitled " What Malaria costs India " which was prepared in 1935 by Lieut.-Colonel J. A. Sinton, a distinguished malariologist of international reputation and a former Director of the Malaria Institute of India.* Major-General G. Covell, the present Director, has expressed the view that the position described in the bulletin remains true today. Colonel Sinton estimated that " at least 100 million individuals suffer from malaria every year in India ". As attacks of malaria lead to a lowering of the resistance of the patient to other diseases, this disease is indirectly responsible for a rise in the morbidity due to other causes. Such indirect effects of malaria are said to be responsible for between 25 and 75 million cases of illness each year.

9. As regards mortality his estimates are equally impressive. Endemic malaria is believed to cause one million deaths in British India, while epidemic outbreaks of the disease may raise the figure by one-quarter to half a million deaths. Including the indirect effects of malaria in raising the general mortality rate in the community, Colonel Sinton thought that a rate of 8 per 1,000 of the population might not be an unreasonable estimate of the total deaths with which malaria would be associated as a cause. On the assumption that the population of British India is in the neighbourhood of 300 millions this rate gives an annual mortality of about 2,400,000 from malaria either directly or indirectly. This figure is about 37 per cent. of the average annual number of deaths in British India between 1932 and 1941.

10. These estimates are undoubtedly subject to a certain margin of error, but they were made by a distinguished malariologist with wide experience of Indian conditions and were based on a careful study of all the material available to him. While it may not be justifiable to accept these figures as precise statements of the incidence of the disease in India, they serve to establish beyond doubt that malaria is by far the most important health problem in the country. Measures directed towards controlling its incidence can confidently be expected to yield a richer harvest of improved health and general wellbeing than action taken against any other disease.

11. An unfortunate feature of the present malaria situation in the country is that, in many parts of the populated areas of India, man has been directly responsible for its incidence through creating conditions favouring the multiplication of the transmitting species of mosquito. For instance, embankments constructed in connection with roads and railways have, in many cases, interfered with natural drainage and have promoted water-logging. Burrow pits

* Its designation was in those days " The Malaria Survey of India ".

are an accepted accompaniment of ordinary house-building operations and other engineering works. In more recent years projects designed to better the economic condition of large sections of the population have resulted in unnecesary addition to their misery. Irrigation projects, which bring water to previously dry areas, will produce malaria unless measures are taken simultaneously for adequate drainage to prevent the development of marshy conditions. The Sukkur Barrage and the Mettur Irrigation Project stand as object lessons of the result of failure to make such provision. In both cases malaria developed on a large scale in regions which were previously free from it. Nor is the ignorant villager free from blame in this respect. In and around the village site he makes and leaves uncovered, during house-building and other operations, pits which form pools and provide favourable conditions for the breeding of the malaria carrying mosquitoes.

12. Some idea of the geographical distribution of the disease in India and of its relative intensity of incidence may be obtained from the following extract from the 1939 Preliminary Annual Report of the Public Health Commissioner with the Government of India:—

> "Areas 5,000 feet above sea level are non-malarious and four widely separated regions, *viz.*, Eastern Bengal, the north-eastern portion of Brahmaputra Valley in Assam and two narrow strips of territory in Madras Presidency, in the Northern Circars and around Madras City, are relatively free from the disease, the spleen rate being under 10 per cent. The malarious tracts can be divided into five main types representing varying degrees of prevalence of the disease. The first consists mainly of the coastal regions of the maritime provinces of Bombay, Madras and Orissa, of wide areas in the Gangetic Valley, of the United Provinces and Bihar and of large tracts in the Central Provinces and the eastern portion of Central India. In these areas malaria is prevalent in a more or less static form of moderate to high intensity, fulminant epidemics being uncommon. Another type of malarious region exhibits the hyperendemicity associated with jungly hill tracts and *terai* land. These areas are widely scattered in the sub-Himalayan regions of the United Provinces and Bengal bordering on Nepal and Bhutan respectively, in Assam, the Chittagong Hill Tracts, the Central Provinces, the Chota Nagpur Hills and in the Western Ghats from a point well to the north of Bombay to the southern tip of the Indian peninsula. A third type consists of an extensive tract of dry area running across India from north to south and comprises Sind, Rajputana, the south-western portion of the United Provinces, a large part of Central India, Gujarat, Bombay, Deccan, Hyderabad and Mysore States and an area in Madras Presidency to the east and south-east of Mysore. This region is characterised by varying degrees of malarial endemicity depending on local factors such as irrigation. There is usually an autumnal rise in fever incidence and epidemics of malaria

may take place at intervals of a few years. To the north of this large area lies a territory consisting of a considerable part of the Punjab, Delhi Province and the north-western portion of the United Provinces, the boundary running well to the east of Agra and Bareilly. This region is liable to outbreaks of fulminant epidemic malaria, the spleen rate being high during and immediately after such epidemics and slowly falling to a low rate in the course of five or six years. A fifth type showing hyperendemicity unassociated with hilly conditions exists in strictly localised areas, for example, the Tanjore district of Madras Presidency, a thin coastal strip above Madras City and isolated spots in Orissa and Bengal."

13. In a review of the action taken by the authorities to control the incidence of malaria it must be frankly stated that the efforts so far made have been quite inadequate to make even a faint impression on the incidence of the disease in the country as a whole. This is partly due to the fact that, in the provinces, a sufficiently large organisation to deal with the problem of malaria control in an effective manner has not yet been established. Further, provision for the treatment of the many millions of cases occurring every year has also been quite insufficient. During the period to which our review relates quinine was the only drug widely in use in the country. The total annual consumption of this drug in India was about 210,000 pounds while, if Lieut.-Colonel Sinton's estimate of at least 100 million individuals suffering from malaria every year is even approximately correct, sufficient quinine should be available, in view of the relapses that occur, for the treatment of at least 150 million cases per year. At the rate of 75 grains per patient, which has been suggested by the Malaria Commission of the League of Nations as the minimum amount required for treatment, India will require about 1·6 million pounds of the drug every year or nearly eight times the quantity actually used in the country. It should be mentioned that, even if this very large amount of quinine became available, the existing health organisations would not have been able to distribute the drug in the affected areas. In the four or five years just preceding the outbreak of the war in 1939, the Government of India gave a few thousands of pounds of quinine to Provincial Governments for enabling them to distribute the drug, free of cost, in the malarious areas within their territories. It is understood that even the distribution of this relatively small amount, which was spread over a few years, could not be carried out satisfactorily because of the difficulty of securing suitable staff for doing it.

14. We shall now describe briefly the antimalaria activities carried out under the auspices of the Central and Provincial Governments.

The Centre

15. Central funds have been expended, for sometime past, on the establishment and maintenance of an all-India organisation for the study of malaria problems and for assisting the provinces with

technical advice in regard to this subject. Starting first as the Central Malaria Bureau and the Entomology Section of the Central Research Institute, Kasauli, the organisation was made, in 1926, a separate institution under the Indian Research Fund Association, which is almost wholly financed by the Government of India and designated the Malaria Survey of India. Later the name was changed to the Malaria Institute of India. It was first designed to undertake teaching and research in the subject but it soon began to be called upon to take up public health work on an increasing scale and to assist Provincial Governments in the investigation of their malaria problems and in the formulation of the necessary control measures. The Government of India took over, in 1940, that part of the Institute which was engaged in duties of this kind while the research activities of the organisation have continued to be financed by the Indian Research Fund Association.

16. The functions of this Institute are the following:—to be fully informed of all malaria problems so as to be able to advise the Central Government on all issues relative to malaria in India, to initiate enquiries and investigations on malaria; to assist provincial organisations in the carrying out of such enquiries as they may undertake and to lend officers temporarily from the staff to work on such enquiries; to undertake systematic research underlying malaria transmission, prevalence and prevention and to arrange for such knowledge to be made available for practical application; to advise upon and assist in the carrying out of antimalaria measures and to undertake clinical work on malaria including treatment; to assist all affiliated researches, *e.g.*, kala-azar, filariasis, sandfly fever, dengue and work on yellow fever carrying mosquitoes of the stegomyia group; to train staff in practical malaria work and to publish scientific articles, bulletins, etc., in the appropriate journals. The staff to carry out these extensive duties consisted, in the prewar years, of a Director, two Assistant Directors, an Entomologist and certain subordinate technical assistants. In the postwar period the Institute will have to expand its activities considerably in the fields of training personnel, of research and of technical assistance to the provinces if the campaign against the disease is to be developed on an effective scale. The need for a suitable expansion of the existing organisation will, therefore, have to be considered in putting forward our proposals for dealing with malaria.

17. During the period of its existence this central malaria organisation has taken a prominent part in the training of antimalaria personnel. Between 1910 and 1938 over 460 civil medical officers were trained, although for a period of about 10 years from 1914 to 1924 the course was suspended owing to the outbreak of the first World War and its after effects. During the present war the need for antimalaria personnel became increasingly urgent with the spread of operations to the Far East and between 1941 and 1945, 24 intensive courses were held which were attended by officers of the Army, Air Force and Navy as well as by a few members of the forces belonging to the Governments of the United States and

China. A certain number of science graduates was also trained as antimalaria assistants. The total number of medical officers and antimalaria assistants thus trained during this period of four years was 630. In addition 426 members of the Indian Hospital Corps and sanitary inspectors received training during the same period. During 1940-41 three courses in malariology were organised for engineers which were attended by 87 officers.

The Provinces

18. A striking feature of the efforts made in the past is that they have been, speaking generally, of a spasmodic character. In this connection we may mention that our attention was specially drawn by the Director of the Malaria Institute of India to such discontinuity of effort on the part of local authorities. He quoted instances where such authorities had commenced antimalaria operations in persuance of advice given by the Institute after an investigation of the local malaria problem and where a lowering of the incidence of the disease has been brought about as the result of such measures. A common sequence of this is a reduction of the antimalaria staff in order to cut down expenditure, followed, in the course of a few years, by a recrudescence of the disease on a large scale.

19. Health administrations seem to have hardly realised the fact that the battle against malaria should not cease with the temporary disappearance of the enemy and that continued operations conducted with adequate staff, working under proper technical provision, are essential if lasting results are to be obtained. Even permanent works for the control of the disease require maintenance while recurrent measures are to be viewed in the same manner as other public health measures such as the cleansing of streets and the purification of water supplies. Every kind of control measure, no matter how simple it may be, requires adequate supervision.

20. Continuity of effort can only be attained if sufficient salaries are provided for the staff so that they may be content to remain in their posts and not be continually on the lookout for more lucrative employment. It is particularly important that labourers employed on antimalaria work should receive a wage at least as high as that paid to any other field workers in the same area. Many of their activities require a considerable degree of technical skill. This is particularly the case in the application of the more modern methods of malaria control, namely the spray-killing of mosquitoes with D.D.T. and similar insecticides. Antimalaria labourers should be classed as semi-skilled, and should be designated as field workers rather than coolies.

21. We have already said that antimalaria organisations have not so far been developed in the provinces on a sufficiently large scale to deal with their malaria problems. At the same time it may be mentioned that, in certain provinces, small malaria organisations exist around which expanded services can be built up in order to meet the requirements of the populations concerned. These organisations are now carrying out antimalaria operations in limited

areas, malaria surveys in selected places and the training of lower types of malaria personnel. Some of these provincial establishments and their activities are described below:—

22. *Bombay.*—The organisation in this province was created on a permanent basis in 1942 on the advice of the Director, Malaria Institute of India. It consists of an Assistant Director of Public Health (Malariology), an Entomologist, six antimalaria medical officers and a team of laboratory and field assistants specially trained in antimalaria duties. For the first three years of its existence, the activities of the organisation were mainly investigatory. It is now proposed to take up malaria control on a comprehensive scale over the whole of North Kanara and part of Dharwar Districts, involving 6,000 square miles of country with a population of over a million.

23. *Madras.*—Two special investigation and control units exist each under the charge of a first class Health Officer and with entomological and field staff attached to it. These units are working at Pattukottai in Tanjore District, and in the area of the Thungabhadra irrigation project respectively. A field station with a first class Health Officer is associated with a land colonisation scheme at Wynaad, Malabar District and is working in liaison with the Agricultural and other Departments. Eight other field stations exist in the province, the more important among which being at Ennore near Madras, at Harur in Salem District, and at Krishnadevipet and Tekkali in Vizagapatam District. A Malaria Officer attached to the office of the Director of Public Health is in direct charge of these field stations, and he also coordinates the entire malaria work in the province. For this purpose, he has two investigation units which may be sent out to the districts. Special investigations are also in progress, such as research work on vegetable oils as substitutes for mineral oils, and investigation of naturalistic control measures by the cultivation of fallow fields with green manure crops prior to transplanting. Other activities include the cultivation of pyrethrum on an extensive scale in the Nilgiris and the Palni Hills, the extraction of pyrethrum in a special plant at the Government Soap Factory at Calicut, and the training of sanitary inspectors, laboratory and field Assistants at Krishnadevipet Malaria Field Station, Vizagapatam District. The last, the oldest field station in the province has been in existence since 1927 and is in charge of an Assistant Malaria Officer. It has several field out-stations in the hyperendemic Agency tracts close by and is well equipped for training laboratory and field Assistants. During the last three years, the station has trained over two hundred such personnel besides giving short refresher courses to sanitary inspectors and health officers. The construction of a permanent building to house the station and its equipment on an adequate scale are under active execution.

24. *The United Provinces.*—The malaria organisation is under the control of an Assistant Director of Public Health (Malariology). Control measures are mainly the responsibility of local health authorities and, besides the usual lack of funds, there is at present a

considerable shortage of antimalaria requisites. Some malaria control measures are being attempted by administrative action, such as stoppage of wet cultivation within a certain distance of the towns, regulation of the amount of water to be supplied for irrigation in certain areas and the enforcement of conditions, subject to which alone water would be supplied, *e.g.*, keeping the water courses leading to the fields clear of rank vegetation. All drainage schemes prepared by local bodies which receive grants from the provincial funds are scrutinised by the Public Health Department as to the possible effect on the incidence of malaria in the area concerned. Orders have been issued recently by the Provincial Government for scrutiny by the Director of Public Health of all major irrigation projects. In order to determine the adverse effect they may have on the incidence of malaria in the area concerned, joint antimalaria committees to represent the military, railway and civil departments have been established in places where such co-operation is necessary for the formulation of antimalaria measures and their execution.

25. *The Punjab.*—Antimalaria operations in the province are under the control of the Punjab Epidemiological Bureau which is in charge of an Assistant Director of Public Health. He is assisted by two Assistant Epidemiologists. There is also a Field Epidemiological Unit which is comprised of a qualified entomologist, two sub-assistant health officers and suitable subordinate staff. This Unit is primarily employed for investigations in connection with malaria and for carrying out malaria control operations, on special occasions, in different parts of the province. In addition 19 officers of the Public Health Department have so far received training in malariology at the Malaria Institute of India or abroad. The medical officers of health, sanitary inspectors and certain other individuals in the service of local bodies are also given, from time to time, short courses in malariology at the Epidemiological Bureau. The latter undertakes a bi-annual spleen census of school children under ten years of age in the province during the months of June and November and, basing partly on these results, prepares a preliminary and final malaria forecast in the month of September every year regarding the probable incidence of malaria in the ensuing autumn.

26. *Delhi Province.*—In the urban areas of this province antimalaria measures have been developed on a large scale during the past six or seven years under the technical direction of the Malaria Institute of India. These measures have included engineering works designed to control the breeding of mosquitoes as well as the active spray-killing of adult mosquitoes during the malaria season through the use of pyrethrum and, lately, of D.D.T. The past few years proved to be a severe testing time for the Delhi antimalaria organisation owing to various factors favouring the spread of the disease, which were largely the result of conditions arising out of the war. The organisation can, broadly speaking, be said to have stood the test in that the epidemic outbreak of malaria, particularly in 1942, which was the year of the largest

incidence, was not permitted to assume the proportions which previous experience, in the years before control operations started, had shown as possible in the Delhi area.

27. The brief descriptions given above of the antimalaria measures carried on in a number of provinces are sufficient, it is hoped, to indicate the total inadequacy of the existing organisations and the work done by them to make an impression of the incidence of the disease in the country as a whole. Before completing the story it must also be mentioned that provincial authorities have been carrying out the free distribution of quinine, and more recently of mepacrine, to the affected populations in their respective territories on as wide a scale as the availability of the drugs and of personnel for their distribution permit. From what has been said earlier in this chapter, it will be seen that only a small section of the affected population could have been reached by such distribution.

TUBERCULOSIS.

The Importance of Tuberculosis as a Public Health Problem in India

28. Tuberculosis ranks high as a public health problem in India. In his annual report for 1933 the Public Health Commissioner stated that " Tuberculosis is now almost certainly one of the main public health problems in India, ranking probably next to malaria in this respect. In fact, it may be regarded as an epidemic disease ". No accurate estimate of the incidence of the disease or of the average annual number of deaths resulting from it can be made. In his annual report for 1935 the Public Health Commissioner suggested that a rough estimate of tuberculosis mortality might be made on the assumption that about 10-20 per cent. of the deaths under " fevers " and about 20 per cent. of those under " respiratory diseases " were actually due to pulmonary tuberculosis. The average annual number of deaths from " fevers " recorded in British India (excluding Burma) during the decennium 1932-41 was 3,622,869 and of " respiratory diseases " 471,802. Using these figures, the average number of deaths per year from pulmonary tuberculosis in British India will range between 456,647 and 818,934.

29. In a memorandum submitted to us Dr. P. V. Benjamin, Medical Superintendent, Union Mission Tuberculosis Sanatorium, Arogyavaram, S. India, expressed his views on tuberculosis mortality and on the prevalence of the disease in the following words:—

> " Mortality figures for cities show a tuberculosis death rate of from 200 to 450 per 100,000 as far as can be ascertained. Little information is available from rural areas, but certain investigations have shown that in small up-country towns the infection rate is nearly as high as in the larger cities, and that in the villages it is lower but still considerable. It can be safely estimated that there are at least 500,000 deaths from tuberculosis annually in the whole of India, and if the general European standard of about 5 cases of active tuberculosis to one tuberculosis death is accepted, there will be at least 2,500,000 active cases of tuberculosis in India."

It will be seen that these estimates are no more than expressions of personal opinion by certain individuals. Even so they are not without value as they help to focus attention on the magnitude of the problem from the point of view of providing adequate medical relief and of instituting the required preventive measures.

The Characteristics of Tuberculosis as a Community Disease

30. The main features of tuberculosis as a community problem are well known. Its incidence is rare among people who lead an open air life and among those who live in small communities, but it increases in proportion to the degree of overcrowding. Close contact with patients in badly ventilated dwellings helps the development of the disease. Children are particularly susceptible to infection and observations by numerous investigators have shown that, in families with one or more patients discharging the tubercle bacillus in their sputum, the children have a much higher rate of mortality from tuberculosis than among children in families with sputum-negative patients.

31. Among other factors contributing to the spread of the disease may be mentioned malnutrition and undernutrition, unhygienic housing and environmental conditions and certain occupations, particularly those associated with the inhalation of dust containing fine particle of silica.

32. No age, sex or race is exempt from tuberculosis. In countries where the disease has been prevalent for a long time susceptibility to infection is highest among infants and a varying measure of protection becomes developed as the years go by, through small doses of infection being picked up by most individuals. It is stated that, in the industrial cities of Europe and America, a large majority of the children become infected with tuberculosis by the time they reach 18 years of age. Only a small proportion of those who take up infection develop the disease or die of it, while the majority acquire a considerable degree of protection against it. On the other hand in communities exposed to tuberculosis for the first time, *e.g.*, primitive races coming in contact with persons from the highly tuberculised countries, the disease occurs in a virulent form and the rate of its spread is rapid. In countries with a long history of tuberculosis infection, it is only among infants that conditions exist which approximate to those of the highly susceptible communities.

33. One more point may be referred to when considering the disease in its epidemiological aspects. There are three types of the organism which can produce disease in man. They are the human, bovine and avian types, the names indicating the species to which each type has become habituated. Of these, infection of human beings by the avian type is relatively rare. On the other hand, in countries where tuberculosis is common among cattle, human infection by the bovine type is not infrequent. It is said that, in England, about 40 per cent. of all milch cows give evidence of having been infected with tuberculosis at some time or other, about 40 per cent. of the cattle slaughtered in public abattoirs show

visible signs of tuberculosis and about 0·5 per cent. of the cows are actually excreting tubercle bacilli in milk.* Infection by the bovine type is caused by the ingestion of the unboiled milk or imperfectly cooked meat of infected animals. In England and Wales about 6·0 per cent. of all deaths from tuberculosis are due to infection of bovine origin.

Tuberculosis Surveys in India

34. We have described, at some length, the salient features of the epidemiology of the disease because these fundamental facts must be borne in mind when considering the question of investigating the extent of prevalence of the disease in the country and of promoting measures for its control.

35. The purpose of a properly conducted tuberculosis survey is to provide information on such matters as the extent of tuberculosis infection in the community concerned and the incidence of the disease in relation to age, sex and various associated factors, including environmental hygiene and nutrition. A special sub-committee appointed by the Indian Research Fund Association has prepared a memorandum embodying detailed instructions for the carrying out of tuberculosis surveys and this memorandum should form the basis for all future surveys undertaken in this field. The studies so far carried out in India have not all been on the lines indicated in the memorandum. However, a brief review of the findings of these investigations is made below:—

36. The first survey of tuberculosis in India appears to have been made by Dr. Arthur Lankester, whose report was published in 1920. The investigation was undertaken under the auspices of the Indian Research Fund Association and occupied a period of two years from July 1914 to June 1916. In the absence of reliable statistics, he had to base his opinion mainly on evidence given by medical officers and administrators in different parts of the country. The conclusion he reached was that the incidence of the disease was steadily increasing. He summed up the position in the following words:—

> "The impression left upon the mind after careful inquiry, with comparison of such statistics as are available, is that many large areas in India, which 40 years ago were practically "virgin soil" to tuberculosis, have now become to a considerable extent infected; that pthisis has been for generations, probably centuries, a common disease of the larger cities, yet even in these there has been considerable actual increase during the last 40 years; that while in smaller towns and in the village districts it was formerly comparatively rare or even absent, yet in these during a similar period the disease has made its appearance and spread widely. The increase has been most marked in connection with those centres which have shown the greatest commercial and educational development, and in the village districts which have been linked up with them by direct lines of communications."

* The Principles of Bacteriology and Immunology by Topley and Wilson.

37. Surveys in limited areas have been carried out in different parts of the country during the succeeding years. The results may be considered from the two standpoints of—

(1) the incidence of tuberculosis infection as demonstrated by certain skin tests, such as von Pirquet and Mantoux tests, and

(2) the presence of tuberculous disease.

A survey of the incidence of tuberculous disease was carried out in a small part of Lahore city in 1933. This survey did not include an investigation of tuberculosis infection by skin tests. Of a total number of 8,269 individuals examined, 311 showed signs of tuberculous disease giving a morbidity rate of 3·8 per cent.

38. In an investigation carried out in a population of 6,665 unselected persons in certain villages and small towns in Chittoor District of Madras Presidency by Dr. P. V. Benjamin in 1938, the following results were obtained. In small towns 40·1 per cent. of the adults and 11·6 per cent. of children under 15 years gave evidence of tuberculosis infection as judged by the skin tests. In the villages the corresponding percentages were 30·8 for adults and 8·2 for children.

39. In 1939 a similar investigation carried out in a large town (Saidapet in Madras Presidency) revealed an infection rate of 69·81 per cent. for adults and 41·2 per cent. for children under 15. Dr. Benjamin and his co-workers pointed out that, apart from the high rate of infection in the community as a whole, which these figures indicated, the rate among children in Saidapet was appreciably higher than the corresponding figures for children which certain investigations in the United States of America and England had disclosed. In 1930 an enquiry conducted by Chadwick and Zacks among 101,118 children under 15 years (mostly living in towns) in Massachusetts gave a percentage of 28 for Mantoux positives and a study by Dow and Lloyd in 1931 of tuberculosis infection among 1,220 children, partly contacts of tuberculous parents in London, gave the percentage as 27·2.

40. Among 3,307 persons examined in Saidapet during this investigation 87 persons were found to be suffering from active disease (2·6 per cent.) and requiring immediate treatment. A significant fact in respect of a number of them was that they were going about their daily duties without knowing that they were sick. Some of them were even excreting the tubercle bacillus. It is stated that, among such open cases, one was a bus conductor, one a clerk in a shop, another a student attending college and yet another the watchman of a public rest house.

41. Dr. A. C. Ukil, who has for many years been actively engaged in the study of the tuberculosis problem, has stated that " In predominently agricultural countries like India, the infection rate varies from 21 to 34 per cent. in rural to 80 to 90 per cent. in urban and industrial areas ". As regards the incidence of the

disease, he has summed up his views in respect of Bengal, to which his work has been mainly confined, in the following words:—

> "From the very few properly conducted surveys in India the disease rate of pulmonary tuberculosis in urban areas (Bengal) appears to be 7 per cent., among workers in industrial areas (Bengal) to be 4 per cent. and in rural areas (Bengal) to be 0·6 per cent. among selected samples of the population. More surveys are needed to assess the correct position with regard to morbidity in different parts of the country. The morbidity rate for pulmonary tuberculosis in tubercular homes in certain localities in Calcutta has been found to be 18 per cent. among children below 15 years."

42. In 1941 a tuberculosis survey was carried out in Sialkot by Dr. C. L. Sahni, the Medical Officer of Health of that town. The survey was limited to boy and girl students up to the age of 18. Of a total of 3,455 boys examined by the Mantoux test, 28·8 per cent. showed a positive reaction. An analysis of the figures by ages showed that the highest percentage of positives (41·6) was recorded in the age period 16-17 and the lowest (12·5) in the age period 5-6. Generally speaking, the percentage rose steadily from the lowest age period, 5-6, through the succeeding years of life. A total of 2,981 girls was examined and of them 39·2 per cent. showed positive reaction, the highest percentage (56·8) being recorded in the age period, 15-16, and the lowest at 6-7. Among the girls also there was, generally speaking, a steady increase in the percentage of positives along with a rise in age.

This investigation did not include an enquiry into the prevalence of tuberculosis disease.

43. From this brief review it will be seen that the incidence of tuberculosis (infection and disease) varies from place to place. There is reason to believe that the susceptibility to tuberculosis differs among various communities. Dr. Ukil considers that "as regards the resistance factor *vis-a-vis* tuberculosis, China and India seem to occupy an intermediate position between the virgin African and the Western European races.....Tuberculosis infection, though increasing in recent years owing to the increasing urbanisation, industrialisation and the introduction of rapid transport facilities, is not yet so widespread as in Europe and America."

44. The view that tuberculosis infection in India is not at present so widespread as in Europe and America should not, however, lead to an attitude of complacency. The death rates from tuberculosis in some of the important cities in India already exceed the corresponding rates in well-known cities abroad. The following figures are quoted from an editorial entitled "Tuberculosis as a public health problem in India" in the 1941 October issue of the Indian Medical Gazette.

Tuberculosis deaths per 100,000 population.

Paris	177	Cawnpore	432
Mexico	170	Lucknow	419
New York	128	Madras	290
Berlin	120	Calcutta	230
London	96	Bombay	140

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45. The increasing urbanisation and industrialisation that the post-war years may be expected to promote in India will lead, unless prompt measures are taken, to a further spread of the disease in the country and to an increase in its incidence in the towns and cities. The continuous exchange of population that takes place between industrial centres and the rural areas is another potent factor for hastening the pace at which infection may spread.

46. The significant part that the bovine type of organism plays in the epidemiology of tuberculosis in certain countries has already been referred to. As regards India, the bovine organism is of much less importance. In his book entitled "Tuberculosis in India" Dr. Lankester brought together a considerable volume of evidence suggesting the comparative rarity of tuberculosis infection among the cattle in India and summed up his views in the following words:—

> "In conclusion, there seems to be ample evidence to justify the deliberate opinion that in India, bovine tuberculosis does not at present call for serious consideration as an important cause of the human disease, and that measures taken with a view to the improvement of the milk supply should be directed towards the prevention of contamination *after* it has been drawn, rather than towards the elimination of tuberculosis from the cow."

Although more recent work has indicated that tuberculosis infection may be present in cattle housed under congested conditions in towns, its incidence continues to be small and the cattle living under open air conditions in the rural areas are free. Another factor for safety is that milk is drunk in this country after boiling.

47. The subject may also be discussed from another angle. Dr. Ukil has isolated and studied different strains of tubercle bacillus from a wide variety of pathological material from patients, such as bones and joints (tubercular abscess), cervical, axillary, inguinal and other glands, lung tissue, pleural fluid, sputum, etc. In all 254 strains have been studied and all the strains have been shown to belong to the human type. All the evidence available seems therefore to suggest that, at present, the bovine type of the organism is of no importance in the causation of human tuberculosis in India. There is, however, need for vigilance. There is the possibility of the spread of the disease among cattle from existing infected animals, although they may be few in number. Imported cattle may also prove to be a source of danger.

48. To sum up, it is not possible to estimate with any reasonable degree of accuracy the incidence of tuberculosis infection and of disease in the country as a whole or in different parts of it. There is reason to believe that its incidence is higher in urban than in rural areas and that, in both types of areas, infection is spreading and active cases of tuberculosis are increasing. The growth of towns and cities, the development of transport facilities and industrialisation are contributory factors to this increase and there is therefore the possibility that their adverse effect may be even more pronounced in the coming years.

49. In limited areas the infection rate disclosed by surveys (*e.g.*, Saidapet) reveals a state of affairs in no way better than that associated with such definitely tuberculised countries as England and the United States of America. The part that contact with tuberculous patients plays in the spread of the disease and the vulnerability of children in particular have also been brought out by the limited studies carried out in the country.

Increasing Interest in the Tuberculosis Problem

50. The tuberculosis problem has of recent years received increasing attention at the hands of the authorities and of the public. Even so the organisation of a campaign against it on proper lines and in adequate proportion has not yet been attempted or even formulated. The reason is not far to seek. A social disease such as tuberculosis can be combated successfully only if ameliorative measures on an extensive scale can be undertaken so as to improve the general standard of living, including housing, nutrition and the sanitation of the environment in the home, the workplace, and places of public resort. An organised effort for improving environmental hygiene has hardly begun, partly because of the high cost involved and partly because the people have not been educated to recognise the need for, and demand the provision of, such improved conditions of life. Secondly the importance of tuberculosis as a public health problem has begun to receive attention only within the past decade or two. As has already been pointed out the first report of a survey of the prevalence of the disease, which was carried out by Dr. Lankester, was published only in 1920 and the brief summary of the subsequent investigations carried out in different parts of the country, which has been given in previous paragraphs, indicates how limited and fragmentary is the information that is available regarding the extent and degree of its prevalence. These pioneering efforts have, however, had the salutary effect of bringing before the authorities and the public the magnitude and urgency of the problem. A third reason is that the existing public health organisations in the provinces, which are still in a relatively early stage of development, have found their time fully occupied with the measures necessary for such epidemic diseases as smallpox, cholera and plague. Moreover, such funds as Provincial Governments are able to spare for the development of health services are altogether inadequate to meet the large expenditure that a modern tuberculosis organisation requires to cover its manifold activities, including preventive care of the patients and their contacts in the home and provision for institutional treatment and aftercare.

51. The awakening of the public mind to the importance of the tuberculosis problem has borne fruit in the organisation of voluntary effort for antituberculosis work and the lines on which two voluntary bodies engaged in this work are functioning are of particular interest in this connection. These organisations are the Tuberculosis Association of India and the Bengal Tuberculosis Association and a brief review of their activities is given below.

The Tuberculosis Association of India

52. The desirability of establishing an All-India association for antituberculosis work and of promoting closer cooperation between Government and voluntary agencies engaged in the campaign against the disease was emphasised by Dr. Lankester as the result of his survey of its incidence in India. This suggestion was implemented in 1929 when it was decided that the funds raised by public subscription to commemorate the recovery from illness of the late King George V during the winter of 1928-29 should be devoted to the promotion of antituberculosis work in the country and the King George V Thanksgiving Antituberculosis Committee was formed. The organisation consisted of a Central Committee at New Delhi and of branch Committees in the Provinces and States. It had only an annual income of Rs. 53,000 and its activities were, therefore, of a limited nature. The Central Committee appointed an Organising Secretary who toured the Provinces and States and organised local branches, addressed public meetings and helped to focus attention on the tuberculosis problem. Its other activities included the organisation of special training courses in tuberculosis for medical men at the All-India Institute of Hygiene and Public Health and at a number of provincial centres as well as the preparation of propaganda material for distribution to the provincial branches.

53. The next stage in the organisation of tuberculosis work on an All-India basis was reached when an appeal was made by Her Excellency the Marchioness of Linlithgow in December 1937 in the name of the King Emperor. This appeal, which met with an excellent response from the people and Princes of India, made it possible to organise the campaign on a broader basis and the Tuberculosis Association of India was formed in February 1939. The King George V Thanksgiving Antituberculosis Fund was merged in the funds of the Tuberculosis Association of India.

54. The Association has a Central Committee in New Delhi and Provincial and State Associations, which are all independent bodies governed by their individual constitutions. The central organisation functions as the agency for giving expert advice and for coordinating the activities of the Provincial and State Associations. Standardisation of methods, the promotion of consultation by conferences, the training of various types of tuberculosis workers, the stimulation of research and education of the public in antituberculosis measures are among its main functions. Other activities, such as the establishment of hospitals and clinics, are considered the responsibility of Provincial and State organisations. Only five per cent. of the total money collected was handed over to the Central Association and 95 per cent. of the amount subscribed in each Province or State was given to the local Association.

55. The outbreak of war, which followed soon after the establishment of the Tuberculosis Association of India, crippled to some extent the activities of the organisation. The Association has,

however, attempted to do what was possible to achieve within the limits set by the war. One of the first steps taken by the Association was the appointment of Dr. Frimodt Moller as its Medical Commissioner in May 1939. His wide experience of the tuberculosis problem in India and the personal contacts he made with other workers and administrators during his tours as Medical Commissioner were of great help to the Association in organising its policy on sound lines from the beginning. Three major measures are associated with his tenure of office. They are:—

(1) the establishment of the tuberculosis clinic in New Delhi,

(2) the creation of the Lady Linlithgow Sanatorium at Kasauli and

(3) the formulation of a scheme for organising home treatment as an essential part of antituberculosis campaign in this country.

56. A scheme for treatment in the home has been working in Delhi for the past few years and it will be discussed in greater detail later. Suffice it to say here that India has altogether a little over 6,000 beds for tuberculosis patients. In countries where antituberculosis work has been organised on sound lines, the number of beds required is estimated on the basis of the annual mortality from the disease. The ratio in respect of such countries ranges between three beds to one death and one bed to one death. If Dr. Benjamin's estimate of 500,000 as the average annual number of deaths from tuberculosis in India is accepted, the disparity between the existing provision for institutional treatment and what should be considered as desirable becomes unmistakably clear. In the circumstances some form of home treatment seems to be essential for meeting the situation.

57. Other activities of the Tuberculosis Association of India were the holding of two conferences of tuberculosis workers at New Delhi in the month of November in 1939 and 1940 and the organisation of facilities for the training of tuberculosis workers, namely, doctors and health visitors.

The Bengal Tuberculosis Association

58. The Bengal Tuberculosis Association is another voluntary organisation which has done much to develop antituberculosis work on sound lines in that province. It was established in 1929. The Association maintains seven dispensaries in Calcutta and Howrah areas, the Chest Department of the Medical College Hospital being the largest of these. A number of dispensaries was also gradually opened in the mofussil. In 1943 eight such dispensaries were functioning at widely separated centres, such as Serampore, Budge Budge, Krishnagar, Barisal, Berhampur, Darjeeling, Kalimpong and Comilla.

59. The work done by the Association within the period, 1929 to 1943, is summarised in tabular form below:—

(1) No. of patients examined at the dispensaries of the Association	704,683
(2) No. of tuberculous patients	41,039
(3) No. of cases of pulmonary tuberculosis among the patients in (2) above	38,365
(4) No. of visits to the homes of tuberculous patients by health visitors	327,607
(5) No. of contacts traced	47,651
(6) No. of contacts examined with tuberculin tests and X-ray	15,530
(7) Percentage of contacts showing signs of active pulmonary tuberculosis	25·02

Of the total number of patients examined at the dispensaries maintained by the Association about 5·8 per cent. were suffering from tuberculosis. A striking feature is that, of the total number of tuberculous patients, 93·5 per cent. had pulmonary tuberculosis. The lung seems therefore to be pre-eminently the organ attacked by the tubercle bacillus.

60. The importance of examining the contacts of patients is clearly brought out by the fact that, of 15,530 such persons, about 25·02 per cent. suffered from pulmonary tuberculosis.

61. The Association trained, during the period under consideration, 102 Health Visitors for antituberculosis work, including 30 candidates from other provinces. It has helped in the training in tuberculosis of the students of the Sir John Anderson Health School (health visitors) and has also taken part in the training courses held in Calcutta for doctors from all parts of India under the auspices of the Tuberculosis Association of India.

62. Since 1933 the Association has received an annual grant of Rs. 10.000 from the Government of Bengal. In addition, the Provincial Government has recently sanctioned a scheme for extending antituberculosis work in the Province with which the Association will be connected. A grant of Rs. 3,000 will be given by Government in each case towards the capital cost of establishing a clinic attached to such sadar and sub-divisional hospitals as are equipped with X-ray facilities. Each clinic is estimated to cost, for its establishment, about Rs. 6,000 at prewar rates and the balance of Rs. 3,000 is expected to be raised by the local committee of the Association which will exercise general supervision over these clinics in so far as the preventive side of the campaign is concerned. Two Tuberculosis Health Visitors will be attached to each clinic, one of them being paid by the Association and the other by Government. The latter have also recently appointed two Tuberculosis Officers to help in the organisation of the proposed antituberculosis campaign.

63. The income derived by the Association from the interest of the King Emperor's Antituberculosis Fund is stated to meet barely half the annual recurring cost of its present activities in Bengal. It is clearly beyond the financial and organisational capacity of a voluntary association to tackle the problem of tuberculosis on

adequate lines. But the work that has so far been accomplished within the past 15 years has undoubtedly helped to focus the attention of Government and of the public on the urgent need for anti-tuberculosis work.

Organised Home Treatment in Delhi

64. The following remarks on the scheme of organised home-treatment in Delhi are based on a note received from Dr. B. K. Sikand, Medical Superintendent, New Delhi Tuberculosis Clinic, who has been closely associated with the working of the scheme.

65. In 1941 the Government of India sanctioned an annual grant of Rs. 8,000 to the Provincial Tuberculosis Association of Delhi for inaugurating an experimental scheme of organised home treatment. The institutions associated with the working of the scheme are the New Delhi Tuberculosis Clinic maintained by the Tuberculosis Association of India, a clinic maintained by the Delhi Municipality and the Ramakrishna Mission Tuberculosis Clinic. The scheme is in operation in a certain number of wards of Delhi city. In the beginning the scheme was introduced in two wards, namely, ward Nos. 10 and 13, the first being placed under the New Delhi Tuberculosis Clinic and the other under the Delhi City Municipal Clinic. In 1942 the scheme was further extended so as to bring ward No. 8 under the New Delhi Tuberculosis Clinic, ward No. 12 under the Municipal Clinic and ward No. 11 under the Ramakrishna Mission Clinic. The grant available for each ward is about Rs. 1,500 per year. The total population of all these wards is 150,000 or approximately 30,000 for each ward.

66. Excepting for minor details the scheme of work is the same. Tuberculosis patients from the areas where the organised home-treatment scheme is in operation are kept under observation and are treated at the clinics assigned to each of these areas.

67. All patients requiring medical care come to the clinic once a month and they also receive a monthly visit in their homes by a doctor on behalf of the clinic. In a very limited number of cases the visits to patients may be more frequent, *e.g.*, cases requiring injections for treatment receive two visits a week. Besides giving treatment the doctor interests himself in the preventive aspect of tuberculosis work, encourages the contacts of patients to come to the clinic for examination, offers advice for the removal of unhygienic conditions in the patients' homes, studies the social and economic difficulties of the home and offers suggestions to the clinics as to how best to meet them in individual cases and supervises the preventive work done by the health visitors. The latter pay frequent visits to the homes of patients in order to advise them and their relatives on preventive measures.

68. A Care and Aftercare Committee has been established in each area, its function being mainly that of raising funds to provide relief to the poorer patients and of keeping contact between the clinic, patients and general practitioners.

69. It is stated that the scheme has not in actual working attained unqualified success. Unfortunately, the starting of the

scheme synchronised with the difficult conditions arising out of the war, which rendered the provision of suitable housing, proper nourishment and other amenities much more difficult than during normal times. Most of the poorer class homes are single room tenements and the inmates live under conditions of great overcrowding. Satisfactory isolation is therefore impossible unless more suitable accommodation can be found for the whole family. It seems essential that postwar plans for improved housing for the people should take into consideration the fact that, in a country like India with its high incidence of morbidity, domiciliary treatment of disease will have to play a large part in the provision of adequate curative and preventive health care to the community. Apart from tuberculosis, the common infectious diseases, and particularly those affecting children, will have to be treated in the homes of the people and the provision of a room where suitable isolation can be practised is therefore essential. This matter should receive consideration in formulating our proposals for the control of tuberculosis.

70. In spite of the handicaps to the working of the scheme under proper conditions, Dr. Sekand points out that organised home treatment has helped to render sputum-negative 15 per cent. of the cases and to bring to light the presence of active disease in about 12·2 per cent. of the contacts of patients. These are no doubt positive gains but the success achieved is hardly sufficient to make an impression on the tuberculosis situation in the area under the scheme. In order that the needs of patients and of families may be met Dr. Sekand estimates that, in each area, a sum of Rs. 300 per year for a population of 1,000 would be required for the satisfactory working of the scheme. On this basis each ward with an approximate population of 30,000 will require Rs. 9,000 per year while the money available at present is Rs. 1,500.

71. When the scheme was initiated, four doctors volunteered to visit patients in their homes on payment of a nominal fee of Rs. 2 per visit. But, owing to the calls on the doctors' time and the unremunerative nature of the payment given to them, they gradually ceased to function and the scheme had to fall back on whole-time doctors employed by the clinic. An extension of the scheme on effective lines can be carried out through the employment of whole-time doctors who are prohibited private practice, provided the remuneration offered is sufficient to secure proper men and to keep them to the job.

72. We have described this domiciliary antituberculosis service in Delhi at some length in the hope that the experience gained here will be of value to health administrations elsewhere, when the development of a similar organisation is attempted.

73. We have already referred to the fact that the total accommodation available in the country for tuberculosis patients is about 6,000 beds. There are 66 sanatoria and tuberculosis hospitals and antituberculosis clinics. Of the former special mention should be made of the institution under the Union Mission at Madanapalli and of a sanatorium at Dadar in Hazara District in the North-West

Frontier Province. Both are doing excellent work. The latter is maintained by the Provincial Government. In relation to the vast problem that tuberculosis constitutes in this country the existing provision for the treatment of such patients is altogether inadequate. A wide expansion of institutional provision and of other antituberculosis activities will be necessary if the disease is to be brought under proper control

SMALLPOX.

74. Smallpox is one of the three major epidemic diseases of India the salient features of which are well known to the public. Therefore, although no completeness can be claimed for the recorded incidence of this disease, health authorities believe that the figures give, for individual areas and for the country as a whole, a fairly clear picture of the prevalence of smallpox and of its exacerbations from year to year. A striking feature of the disease is its variability in incidence. For instance, within the period of 60 years from 1880-1940, the average annual rate of smallpox mortality per thousand of the population has ranged from 0·1 to 0·8. Even after making allowance for such variability, there is reason to believe that the total incidence of the disease has decreased in the country as a whole. For instance, if the two ten-year periods, 1902-11 and 1932-41, are compared and due allowance is made for the increase in the population of the country, the rates of mortality from smallpox per 100,000 of the population are seen to be 40 and 25 respectively. Nevertheless, it is a matter for serious concern that the average number of deaths per year from smallpox for the period 1932-41 should have been as high as 69,474. The annual epidemiological reports which are published by the League of Nations show that the rate of incidence of smallpox in India is the highest among all the countries for which statistics are given. That the large amount of suffering and mortality for which smallpox is responsible should be permitted to continue is all the more regrettable because we have in vaccination a powerful weapon with which the disease can be kept under effective control.

75. Of the total number of smallpox deaths at all ages high proportions occur among infants under one year of age and among children between one and ten years. During the five-year period, 1937-41, deaths due to smallpox among infants under one year, when expressed as percentages of the total mortality from this cause at all ages, ranged from 12·1 to 19·7 and, during the same period, the corresponding percentages for children between one and ten years varied from 19·2 to 30·5. Such high rates of incidence of the disease among children at these two age periods have been a feature common to practically every province in India. If effective primary vaccination is being enforced in the country, it is children under ten who should have the highest measure of protection and it seems to us that the continued high rates of smallpox mortality at the two age periods is a clear indication of the inadequacy of existing administrative measures to enforce primary vaccination.

76. One of the serious consequences of smallpox is that, not infrequently, those who recover from it lose their sight partially or wholly. Blindness is a very serious handicap in life to all persons and is particularly so in the case of children with the prospect of a much longer period of disability than for those who lose their sight at a more advanced age.

Vaccination against Smallpox

77. Vaccination was the first preventive measure which was introduced in India and practised on a large scale. It was introduced first into Bombay in the year 1830 and a Vaccination Department was formed in 1858. Other Provincial Governments also developed Vaccination Departments in due course and the practice of this preventive measure has therefore been prevalent in the country for well over three quarters of a century. Nevertheless, primary vaccination is compulsory only in about 81 per cent. of the towns of India and 62 per cent. of the rural circles. Indeed, in Bombay Presidency, which first adopted vaccination, primary vaccination is enforced only in 4·9 per cent. of the rural circles, while in the North-West Frontier Province, the United Provinces, Sind, Coorg and Ajmer-Merwara it is not compulsory even in a single rural circle. The position as regards revaccination is even worse. It has been compulsory in the province of Madras for the past decade or a little more. In other parts of India, compulsory revaccination is enforced only as a temporary measure through special regulations issued under the Epidemic Diseases Act, when an outbreak of the disease on a large scale makes it necessary for the health authorities to adopt this measure.

The Manufacture of Vaccine Lymph

78. This is undertaken at seven provincial centres, *e.g.*, Ranchi (Bihar), Nagpur (Central Provinces), Guindy (Madras), Calcutta (Bengal), Patwa Dangar (United Provinces), Lahore (Punjab) and Belgaum (Bombay). In each of the above centres vaccine production follows generally accepted lines and there is therefore no need for departure from the existing practice. This view is based on the enquiries which we were able to make during our tours as well as on the report of a special officer deputed by the Public Health Commissioner with the Government of India, who visited each of the above centres in order to enquire into production methods.

The Distribution of Lymph

79. The methods of distribution of vaccine lymph, from the point of view of its keeping its potency during use in the field, has been, we understand, one of the subjects into which the officer on special duty, to whom we have referred above, investigated and an improvement of the existing practice seems desirable in order to prevent deterioration in the quality of the lymph. In these days of increased facilities for cold storage made possible by the use of thermos flasks and electric or non-electric refrigerators, advance in this direction should present little difficulty.

The Vaccinator

80. The conditions of service of the vaccinator require considerable improvement in certain provinces before efficient work can be expected of him. This subject has been fully discussed in Chapter III of this volume.

81. Another matter for consideration in this connection is whether the continuance of this special class of worker is necessary. Smallpox vaccination is only one among the many forms of preventive vaccination which the health department should carry out for protecting the community and the process is relatively of a simple nature. However desirable the maintenance of a special class for smallpox vaccination might have been in the past, it is for consideration whether; in a modern health organisation such as the one which India will be expected to develop for herself in the postwar period, there is room for this type of health personnel. A man who knows that his days will be spent on work of an unpopular and routine nature and that his pay will be low can hardly be expected to play his part with energy and zeal in the new health order we envisage.

The Vaccination Season

82. In all provinces there seems to have grown up the practice of carrying out routine vaccination mainly during the cooler months of the year. The reason for this is, we understand, the need for avoiding deterioration of the quality of the lymph during transit from the laboratory where it is produced and during its use for vaccinating the people. The period during which large scale vaccination operations are performed in the provinces thus becomes limited to six or seven months in the year. This is, in our view, unfortunate because what is required is an intensive effort to immunise the community as a whole and to keep up the high level of protection so attained by periodical revaccination. A lengthening of the vaccination season to cover all the twelve months is highly desirable. The development of the necessary facilities for cold storage and for the transport of vaccine lymph for use in the field should not prove difficult in the coming years.

CHOLERA

83. Cholera is another preventable disease which takes a heavy toll of life in the country and shows a wide range of variation in its incidence from year to year. Below are given figures for cholera mortality in British India, excluding Burma, as averages for quinquennial periods from 1877 to 1941:—

Period	British India (Excluding Burma) Annual average	Period	British India (Excluding Burma) Annual average
1877-81	288,949	1912-16	328,593
1882-86	286,105	1917-21	392,070
1887-91	400,934	1922-26	143,890
1892-96	443,890	1927-31	297,756
1897-01	383,294	1932-36	140,440
1902-06	367,160	1937-41	147,423
1907-11	397,127		

84. In spite of the smoothing introduced by averaging in five-yearly periods the range of variation is extensive, from about 141,000 to 444,000. If the figures for individual years were examined, the variation in incidence would be found to be even higher. Some idea of the range of variation in the annual incidence of the disease may be obtained from the cholera mortality figures for the province of Madras in 1939 and 1943. In the former, total deaths from cholera was 2,115, the lowest incidence recorded for 60 years. In 1943 the disease spread to every district in the province and the registered mortality from this cause was 117,039. The incidence of cholera varies from province to province, those in which its prevalence is high being Madras, Bengal, Bihar and the Central Provinces and, to a smaller extent, Orissa and the United Provinces.

The Epidemiology and Control of Cholera

85. The main facts regarding the epidemiology and control of cholera have been known for some time past. The disease is caused by an organism which is given out in very large numbers in the motion and the vomited material of cholera patients. The usual mode of spread of infection is through the transference of the organism either to drinking water or to food and its subsequent ingestion by healthy human beings. Contamination of food generally takes place through flies while water supplies, particularly in the rural areas, are infected by ignorant villagers carrying infective material from houses in which the disease occurs, into common sources of water such as tanks, wells or other forms of supply.

86. The measures which are required for the control of the disease fall broadly into two groups, (*a*) those which are permanent and (*b*) those which are of a temporary nature. The former include the following:—

(1) the provision of protected water supplies;

(2) the satisfactory disposal of nightsoil so as to prevent the possibility of contamination, by infective material, of food and water supplies and

(3) sanitary control over the production, distribution and sale of food.

87. In regard to each of these the position in India to-day is far from satisfactory. Protected water supplies are available only in the larger towns and cities and they serve only small proportions of the population in individual provinces. Provision for the proper collection and disposal of nightsoil is quite inadequate in rural areas and in the majority of urban centres, including many towns and even certain cities. The sanitary control exercised over the production, distribution and sale of food leaves much to be desired in all parts of the country. We have discussed these matters in the relevant chapters of this volume of the report and need not therefore traverse the ground again here.

88. Anticholera measures of a temporary nature are of special value when an outbreak of the disease takes place. These include:—

(1) isolation and treatment of patients;
(2) disinfection of infective material and
(3) immunisation of the people by anticholera inoculation.

89. As regards (1) and (2) above we have already shown earlier in this chapter that, under existing conditions, little or no effective action is being taken in large parts of the country, particularly in the rural areas. As regards anticholera inoculation, the popularity of this measure has been a process of steady growth. The people have come to recognise its value and are, broadly speaking, willing to accept inocualtion when an outbreak of the disease takes place. They are, however, unwilling to submit themselves to it in anticipation of a possible spread of the disease to the area where they live. The fact that the protection conferred by an inoculation lasts only a few months might be a contributory factor to this attitude of indifference towards anticipatory vaccination against the disease. At the same time, the people have responded, in the recent past, to the appeal of the health authorities for mass inoculation during epidemics in a remarkable manner. During the past few years, when the abnormal conditions arising out of the war produced widespread outbreaks of the disease in many parts of the country, millions of inoculations were carried out. For instance, in Bengal alone, within the period from 1st November 1943 to the end of September 1944, about 18 million inoculations were performed.

Part played by Festival Centres in the spread of Cholera

90. Festivals, which attract large gatherings of people from different parts of the country, have played an important part in the incidence of the disease. In more recent years the sanitary control of these festivals on an extensive scale has been undertaken by provincial health authorities with a considerable measure of success. Even with such precautions the possibility of a large-scale outbreak of cholera resulting from such festivals was demonstrated in April 1938 when the disease, starting at the Hardwar festival, spread far and wide over the provinces of the Punjab, Delhi, the United Provinces, Bihar and the Central Provinces. In the circumstances the compulsory inoculation of persons, who are permitted to visit such festival centres, would constitute another important measure to strengthen the fight against the disease. The Central Advisory Board of Health advised, on the basis of a report by a special Committee which it appointed, that Provincial Governments should introduce an indirect form of compulsory inoculation through the prohibition of entry of uninoculated persons into festival centres. This suggestion has been tried in more than one province and has, on the whole, proved to be of value.

Endemic Centres of Cholera

91. Certain parts of India are considered to be endemic foci of cholera infection in that it tends to break out in such places every

year at the appropriate cholera season. Such centres are said to exist in Bengal and in the Cauveri Delta in the province of Madras. These endemic foci are held to be the places from which the disease spreads to other parts of the country, where cholera occurs often only at intervals of a few years. Therefore, from the point of view of the country as a whole, it would seem desirable that the permanent measures, to which we have referred in an earlier paragraph, should be applied to such endemic centres of the disease, in order that these sources of infection may be effectively controlled and cholera eliminated from them. This view has been upheld by the findings of an extended enquiry into the epidemiology of cholera, which was carried out in this country between 1934 and 1940 under the auspices of the Indian Research Fund Association. A review of these studies was published a few years ago and it states that " the problem of primary importance in the epidemiology of cholera is the existence of endemic areas in which cholera is permanently present . . . . Cholera is eminently a controllable disease . . . . . It is obvious that the point at which preventive measures should be applied is the area from which the infection is primarily derived—this is in the endemic areas ".

PLAGUE

92. There is reason to believe that plague was prevalent in India many centuries ago and that the infection continued to exist among rats in the south-western Himalayan region. The history of plague in recent times dates from 1896 when it was introduced into the seaport of Bombay from China and spread rapidly over very large parts of the country. In 1904 deaths from this disease reached the very high figure of nearly 1,150,000. Since then there has been a gradual decline in the incidence of plague till, within the past ten years, its prevalence has become reduced to a considerable extent. The figures given below, which are quoted from the Preliminary Report of the Public Health Commissioner with the Government of India for 1939, indicate clearly this decrease in the incidence of plague.

British India.

Period	Total plague deaths.	Figures in column 2 expressed as percentage of total deaths during 1898–1938	Annual average
1898–1908	6,032,693	49	548,427
1909–1918	4,221,528	34	422,153
1919–1928	1,702,718	14	170,272
1929–1938	422,880	3	42,288
	12,379,819		

The average annual mortality from this cause during the three years 1939, 1940 and 1941 was only 19,347 or 45·7 per cent. of the corresponding average for the ten-year period, 1929-38.

The Epidemiology of Plague

93. Plague is primarily a disease of certain rodents and human infection on an appreciable scale takes place only under conditions favouring close association between man and such rodents. In certain parts of the world, plague infection among such animals never dies out and these constitute endemic areas from which infection spreads to other regions from time to time. In India the animal is the rat while in South Africa it is the gerbille, in California the ground squirrel and in South-eastern Siberia and Manchuria it is the tarbagan. Periodically outbreaks of the disease take place on a large scale among such animals and destroy large numbers of them. For a time the infection lies dormant but, when the animals breed and a large susceptible group is produced, an epidemic wave starts again.

94. Man becomes infected from such animals through the bite of the fleas which live and feed on them. Without going into details regarding the mode of transmission of infection it will be clear that opportunities for close association between man and the special rodent responsible for keeping alive plague in the area concerned is a very important factor for the production of the disease in human communities. Widespread outbreaks among such animals may lead to territorial extensions of plague while the transportation of infected rats or infected fleas through grain traffic or in other ways may result in the starting of the infection in areas far removed from the endemic foci of the disease.

95. Plague appears in two main forms, bubonic and pneumonic. The former is characterised by the development of buboes or swellings in the groin, arm-pit or neck of the patient and, although it is the less severe form of the two, the rate of mortality may be as high as 60 to 70 per cent. among those who are attacked. It is in the transmission of bubonic plague that the rat and certain types of rat fleas play their part. Pneumonic plague is a form of severe pneumonia set up by the plague germ and its infection is conveyed from person to person through the air. The chance of any one in contact with a patient contracting pneumonic plague is very high and the rate of mortality is practically cent. per cent.

96. The epidemiology of plague in India, which is mainly of the bubonic form, was worked out by the Indian Plague Commission. The role of the rat and the rat flea in the transmission of the disease was demonstrated by this Commission. One of the workers on it, Haffkine, developed the anti-plague vaccine which has been in use in the country for conferring protection against the disease. The Provincial laboratory in Bombay, in which plague investigations were initiated, was named after him as the Haffkine Institute and it has continued to be the centre of plague research in the country since that time.

97. Although the incidence of plague has become very much reduced within recent years, the present Director of the Haffkine Institute, Lt.-Col. S. S. Sokhey, I.M.S., considers that certain endemic areas exist in different parts of the country and that they

constitute a constant threat in as much as, under favourable conditions, the disease may spread from these centres to other parts of the country. These centres are situated in cool and moderately damp areas in different parts of India, from the Himalayas in the north through Central and Eastern India to the Deccan and the province of Madras. They are therefore fairly widely distributed and, in view of the past history of plague not merely in India but in other countries, which shows that, during certain periods, the disease may spread widely and, at others, exhibit a contraction in the territory covered and a marked decrease in the number of cases occurring in the affected areas, these endemic centres may continue as potential sources of danger to the country as a whole, unless they are effectively brought under control.

Plague Preventive Measures

98. The measures which are necessary against the disease are mainly those directed against the rat as the primary reservoir of infection from which the disease spreads to man. What is required is to prevent, as far as possible, the close association of man and rats. The keeping down of the rat population in inhabited areas, particularly in the endemic centres of plague, is therefore an important preventive measure. Rats grow in numbers in human dwellings only when they can secure food and adequate protection. The elimination of these conditions is therefore the purpose in view. The systematic destruction of rats by various methods so as to keep down their number is also another important measure which is adopted.

99. The steps to be taken for rendering the conditions in residential areas unfavourable to the growth of the rat population include (*a*) the construction of rat proof dwellings and rat proof grain stores and railway godowns, (*b*) control over the location of certain trades and industries which attract rats, and (*c*) an improvement of the general sanitary condition of the towns and villages, as the throwing of garbage in public places encourages the breeding of rats by providing them with food. As regards all these measures it may be stated that no effective action has been taken, in the past, by the authorities concerned in the endemic areas of plague so as to produce conditions unfavourable to the growth of the rat population. The destruction of the existing rats has also been carried out in far too perfunctory a manner to make any impression on their numbers.

Treatment of Plague Patients

100. As in the case of cholera and smallpox the vast majority of plague patients, particularly in rural areas, receive no treatment for the disease. Fortunately, in the case of bubonic plague, the infection does not spread from patient to patient. Otherwise, the general absence of provision for the isolation and treatment of patients becomes another factor favouring the spread of the disease.

101. Till recently, there was no specific treatment for plague and the efforts of the physician were mainly directed towards giving relief to the patient and to the keeping up of his strength in the fight against the disease. The manufacture of a potent serum has been attempted by more than one investigator in different countries. A few years ago the Director, Haffkine Institute, prepared a serum which, on field trial, was established to be definitely more effective than the ordinary form of treatment. Sulphapyridin and sulphathiazole have also been found to be useful in the treatment of plague. Of the two, sulphathiazole is considered the better drug because its effectiveness is probably a little higher and its toxicity less.

Plague Research

102. We have already pointed out that the Indian Plague Commission was responsible for discovering the more important facts regarding the mode of spread of plague and for showing the way for the organisation of preventive measures on sound lines. In more recent years extensive field research was carried out in the Cumbum Valley in Madura district of the province of Madras, which is one of the endemic centres of the disease. The length of life of the infected flea, methods of effective disinsectisation of grain bags and other vehicles through which infected fleas and rats may transmit the disease, the effectiveness of cyanogas fumigation of rat-holes as an anti-plague measure and the evolution of a rat-proof hut suitable for rural conditions are among the various matters associated with the plague problem which the investigation unit in this area studied. As regards the use of cyanogas the conclusion reached was that, if systematically carried out in endemic areas, it helps to keep down the rat population and thus reduce the incidence of plague. At the Cumbum Valley a type of rat-proof hut was evolved costing less than Rs. 100 which was shown by close observation to have remained free from rats for two years. The popularisation of such a type of dwelling should prove useful in the campaign against plague.

Preventive Inoculation

103. As in the case of cholera inoculation, the popularity of plague inoculation has steadily increased. The Director of the Haffkine Institute, Bombay, who is responsible for the manufacture and issue of plague vaccine for use throughout India, has pointed out that, in spite of a continued fall in the incidence of plague, the demand for plague vaccine has increased. When an outbreak of plague is imminent or when the disease is actually prevalent, preventive inoculation is the one measure which should be carried out with the greatest possible vigour.

LEPROSY.

104. The number of persons suffering from leprosy in the world has been estimated as somewhere about five millions and, of these, leprosy patients in India are believed to be at least a million. The present distribution of leprosy in the world shows that its

incidence is high in certain parts of Africa, India, South China and South America. All the affected areas are in tropical or sub-tropical countries and only a few foci of infection persist in the colder countries. In India " there is a belt of high incidence including the whole of the east-coast and the south of the peninsula, including West Bengal, South Bihar, Orissa, Madras, Travancore and Cochin. In the central parts of India the incidence tends to be lower but there are some foci of higher incidence. There is a belt of moderate incidence in the Himalayan foot hills, running across the north of India, while in most of the north-west of India there is very little leprosy ".*

105. In the highly endemic areas its incidence may range from two to five per cent. of the population. In restricted areas in such endemic regions the proportion of cases may rise to 10 per cent. of the population while individual villages may show a rate as high as even 15 to 20 per cent. In the non-endemic regions of North-Western India, on the other hand, large areas may show no cases at all while the general level of incidence is stated to be as low as 0·01 per cent. or one per ten thousand of the population.

106. The public health aspect of the leprosy problem in an area is determined not merely by the rate of incidence of the disease in the population but also by the relative severity and infectiveness of individual cases. Cases of leprosy are broadly divided into two groups, the " neural " and " lepromatous " types. The former constitutes the " benign " form of leprosy and, as pointed out by the International Leprosy Congress, 1938, " these cases give evidence of relative resistance to the infection, or of relatively good prognosis as regards life although mutilation may take place . . . . . Bacteriologically the skin lesions are typically but not invariably found negative by standard methods of examination, though the nasal mycosa may be found positive ". The lepromatous type consists, on the other hand, of the " malignant " form of leprosy, " in which the patient is relatively non-resistant, has a poor prognosis and exhibits lepromatous lesions of the skin and other organs, especially the nerve trunks. Bacteriological examination usually reveals abundant bacilli ". It is therefore the lepromatous case that is usually much more infective than the neural case. While for the country as a whole the proportion of lepromatous cases is estimated at about 20 per cent. of the total number of leprosy patients, there are areas where the proportion of this severer type is as low as 4 per cent. and others in which it rises even to 50 per cent. The special Committee of the Central Advisory Board of Health, to which we have referred, has stated that " it is unusual in India to find an area where leprosy is both very common and severe. In Bengal, Bihar, Orissa and in the north-east part of the country in general, leprosy appears to be relatively common and relatively mild. In the foot hills of the Himalayas and in the areas to the north-west, leprosy is relatively

* Report on Leprosy and its Control in India (1941) by the Special Committee appointed by the Central Advisory Board of Health.

rare and severe. In the south, *e.g.*, Madras, leprosy is very common but also more severe than in the north-east, though less severe than in the Himalayan foot hills". In estimating the importance of leprosy as a public health problem the rate of incidence and the relative proportion of the lepromatous type should both be taken into consideration.

Antileprosy work in India

107. The first known leprosy asylum was established in Calcutta early in the 19th century. In the later years numerous other institutions were established by missionaries, local authorities and private benefactors.

Mission to Lepers

108. But systematic attempts to bring medical relief to leprosy patients started with the foundation of the Mission to Lepers by Mr. Wellesley Bailey, who, coming to India in the Indian Police Service in 1869, was soon attracted to leprosy work and threw himself whole-heartedly into it. He established the Mission to Lepers and founded its first leper institution in Chamba in the Punjab in 1875. In the succeeding years the Mission extended its activities to such an extent that, in 1937, when Mr. Bailey died, there were 32 institutions in different parts of the country under its control providing accommodation for 8,000 patients. It is understood that the Mission also gives financial aid to 17 other institutions which admit 2,600 patients.

The total number of institutions for leprosy is about 95 with accommodation for about 14,000 patients.

The Indian Council of the British Empire Leprosy Relief Association

109. Another institution which has taken an important part in the development of leprosy work in this country is the Indian Council of the British Empire Leprosy Relief Association. It was established in 1925 with funds raised by an appeal by Lord Reading, the Viceroy of India. A sum of Rs. 20 lakhs was collected and the interest from this amount constitutes the funds for the activities of the Association. It has its central office in New Delhi while branches exist in the different Provinces. Approximately one-half of the annual income of the Association is given to the provincial branches and the main activities of the latter have been the carrying out of leprosy surveys and the establishment and maintenance of treatment centres. The central organisation, on the other hand, has concerned itself mainly with the promotion of leprosy research, the provision of facilities for special training for doctors in the diagnosis and treatment of leprosy, propaganda work and co-ordination, through the provincial branches, of governmental and voluntary effort in the campaign against the disease.

Antileprosy work in the Provinces

110. We may at this stage describe briefly the antileprosy work we saw in certain institutions during our tours in the provinces.

At Bombay the Ackworth Leper Home deals with pauper and non-pauper inmates and outpatients. There is usually considerable overcrowding, about 500 inmates being present while accommodation exists only for 400. Total figures for outpatients treated at the special clinic were 871 in 1941, 991 in 1942 and 1187 in 1943. The institution carries out a certain amount of field work in the way of follow-up of patients, examination of contacts and propaganda. For these two specially trained health visitors are employed. The Executive Health Officer of Bombay Corporation is an active member of the managing board of control and is its secretary. Attempts have been made to introduce occupational therapy and a co-operative shop for the patients is managed by the inmates themselves. Facilities exist for private medical practitioners to obtain special instruction in leprosy, and lectures and demonstrations are arranged for students of the Grant Medical College.

111. In Orissa, a province in which leprosy is widely prevalent, we visited two colonies at Puri and at Cuttack respectively. To the Puri colony only infectious cases are admitted. The accommodation available at this colony is unfortunately limited. We understand that, if more accommodation were available, many more patients would willingly enter the institution and if separate provision could be made for better class persons, patients belonging to these classes would also probably be willing to accept segregation. The asylum at Cuttack is managed by the Mission to Lepers and provides for about 400 patients. Here there is provision for such activities as gardening, games, etc., and three schools are run separately for men, women and children. The Boy Scout and Girl Guide movements are actively supported by this colony. The institution provides special training in leprosy for medical licentiates and compounders. All the clothing required in the colony is made by the inmates themselves.

112. In Bihar the Mission for Lepers runs a large colony for about 860 patients in Purulia. Here much stress is laid on the systematic medical examination of patients and, for the last 20 years, a complete record has been kept of every patient in the home. The institution has a large and well attended outpatient department. Occupational therapy is practised and here also the clothes worn by the inmates are made by themselves. The Mission trains the more able-bodied patients to serve as nurses and attendants on other patients. The schools for boys and girls as well as the one for adults are, with one exception, entirely staffed by leprosy patients. Segregation of the healthy children of lepers in separate cottages has been provided for. There are several other large institutions in Bihar. We shall, however, refer only to the leprosy clinic in Patna, which is maintained from grants from the Provincial Government, the District Board and the Patna municipality and from certain charitable funds. No records of individual patients were maintained at the time of our visit and no attempt was made to organise follow-up work. We draw attention to these defects because we feel that an institution maintained at the headquar-

ters of a Province and which the Provincial Government supports should aim at a higher standard of performance.

113. The Central Provinces represent, as a whole, an area of low incidence, with, however, some areas of higher incidence. Eight leper asylums are maintained by the Mission to Lepers providing accommodation for some 2,100 inpatients. About 38 leprosy clinics are working in association with Government hospitals and dispensaries. In Wardha district some 500 lepers receive treatment at the outpatient clinic run by the Maharogya Seva Mandal, which also maintains hospital accommodation for 21 infectious lepers. Provision exists for follow-up, for the examination of contacts and for propaganda work. We were surprised that, at the clinic at Raipur, which is the headquarters of the Special Leprosy Officer for the province, no beds are provided and no follow-up work is attempted, the excuse being the absence of health visitors. We saw a very large settlement run by the Mission to Lepers at Chandkuri in Bilaspur district, which houses about 600 cases and is well maintained. There is also provision here for occupational therapy.

114. Active work on leprosy has been carried out in Madras in past years under the direction of Dr. Cochrane working with the Mission to Lepers. The two chief centres are Chingleput and Saidapet. Excellent institutional and outdoor work has been organised. In this connection we would refer to the reports by Dr. Cochrane and his colleagues on the work of the Saidapet health project and the Chingleput leprosy institution. Further, Dr. Cochrane has, through his advice to the Provincial health authorities, helped to promote a progressive policy in regard to antileprosy work in the province.

Certain Special Aspects of the Leprosy Problem

115. *The segregation of infectious lepers.*—Although the number of persons suffering from leprosy in India is estimated as approximately one million, in most parts of the country a high proportion of such patients, probably about 70 to 80 per cent., are in the non-infective stage. Even so, infective patients may number about 250,000 in the country. Although leprosy requires for its transmission close and prolonged contact and it does not therefore spread with the rapidity of diseases like cholera and smallpox, isolation of infective patients is the one measure which has been found to be effective in all parts of the world for the control of the disease. The need for such isolation becomes all the more emphasised when it is remembered that children are more susceptible to infection than adults and that the unsuspecting father and mother in an infective condition may continually be exposing their children to the risk of contracting the disease. While the estimated number of those requiring isolation is about 250,000 the total institutional provision for such isolation is in the neighbourhood of 14,000. No conceivable expansion of institutions in the immediate future can help to make up the large difference between existing provision and what is required to meet the needs of the country. The

need for developing group isolation under conditions suited to local requirements is therefore great. Schemes for this purpose must be sufficiently cheap if they are to be adopted on a wide scale, while they must also take into account the habits of life of the people and the special circumstances associated with the areas concerned. Attempts to develop group isolation have been made in different parts of the country in the recent past, but efforts in this direction must continue on the part of provincial health authorities before reasonably satisfactory schemes can be developed.

116. *The Problem of beggars with leprosy.*—Beggars with leprosy are found in varying numbers in a large number of towns and cities, in places of perennial pilgrimage and in all centres where pilgrims congregate periodically. The Special Committee has pointed out that, in Calcutta, there are about 1,000 beggars with leprosy, most of them having come from other provinces, and that the profession of begging has been organised by them to a high degree of perfection under a headman. Many of them are married to persons who are also suffering from leprosy and the quarters occupied by them are usually separated from those of the general population. In religious centres the common custom of giving alms to beggars and the frequent feeding by charitable persons constitute incentives which help to concentrate them in relatively large numbers. The large majority of these beggars are leprosy patients. While a certain proportion of them are burnt-out cases and are non-infective, the Committee points out that " the statement not infrequently made that almost all beggars with leprosy are not infective is not true ".

117. *Leprosy in relation to industry.*—The Committee has thus briefly stated the problem:—

> " During recent years some evidence has been accumulating to show that the development of industry is probably having an influence on the spread of leprosy and the possibility of this increase must be borne in mind. Leprosy surveys of industrial workers have been carried out in various parts of India and an incidence of between 1 and 2 per cent. has often been found, and a considerable number of cases have been infective cases. The presence of these infective cases in the crowded *bustics* and living quarters of industrial workers is a definite menace to the other workers and their families. The fact that the industrial population of India is largely migratory increases the menace to public health. Not infrequently in village surveys one comes across patients with leprosy who attribute the disease to having been infected while working in industrial centres. Sometimes such a patient having contracted the disease in an industrial centre, will return to his village and introduce the disease there where it was not previously found."

Leprosy Legislation

118. Existing provisions for the control of leprosy are contained in (1) an all-India Act, the Lepers Act and (2) the provincial Local

Self-Government Acts. In the latter provision against leprosy is mostly confined to urban areas. The provincial Acts deal with leprosy in the same manner as the common infectious diseases such as cholera, smallpox and plague. In practice these powers have hardly been used by local bodies in respect of leprosy.

119. As regards the Lepers Act, its defects include that it makes no differentiation between infective and non-infective cases and that it deals with only certain classes of patients, namely, the beggar with leprosy, persons with the disease who prepare for sale or sell articles of food, drink, drugs and clothing, and with certain other matters such as the use of public wells and tanks by such patients for bathing and washing and the use of public conveyances by them. The Special Committee of the Central Advisory Board of Health considered that " this Act appears to be based mainly on considerations of public sentiment which cannot be ignored." Taking into consideration the deficiencies of this Central Act and of existing provincial legislation the Committee considered that comprehensive leprosy legislation should be undertaken and it has indicated certain principles which should guide such legislation. Reference may, in this connection, be made to appendix 19 in Volume III of this report.

VENEREAL DISEASES

Estimates of the Prevalence of Venereal Diseases

120. No reasonably accurate estimate of the incidence of venereal diseases in India (we include here only syphilis and gonorrhea as the two important diseases in this group) is available. As far as we are aware, the only attempt to estimate the prevalence of these diseases on a countrywide scale was made as part of an enquiry, the results of which were published in 1933, by Sir John Megaw, the then Director General, Indian Medical Service, into certain public health aspects of village life in India. This investigation based its findings on the replies to a questionnaire sent by him " to a large number of doctors whose dispensaries are situated in typical agricultural villages scattered throughout British India ". Sir John estimated, on the basis of the figures he received, that there were probably about 5·5 million cases of syphilis and 7·6 million cases of gonorrhea. He pointed out that " syphilis and gonorrhea appear to be more common than has been usually believed; Bengal and Madras easily head the list. The data suggest that something like 5½ millions of people in India actually show signs of syphilis so that, if account be taken of those who have had the disease and have lost all obvious signs, it would probably be well within the mark to assume that 10 to 15 per cent. of the inhabitants suffer from syphilis at some time or other during their lifetime. The strikingly low rates of venereal disease in the Punjab are entirely in keeping with impressions based on other sources of information ".

121. Existing statistics relating to these diseases are those of cases attending hospitals and outpatient clinics. Such figures are

not of much value in assessing the extent of their prevalence in the population as a whole. In reply to a questionnaire which we sent to provincial Administrative Medical Officers and Directors of Public Health, we received certain general remarks regarding the incidence of these diseases which, under the conditions existing in the country, can only be accepted as the impressions of the officers concerned. Even so, it may not be out of place to quote these remarks.

122. In Madras it has been stated that venereal diseases are prevalent " to an alarming extent in urban and industrial areas and pilgrim centres ". It has also been pointed out that there has been an increase in these infections since the outbreak of the war. In Delhi, it is said that they are widely prevalent in the city, although no estimate of their incidence can be given. In the Central Provinces and Berar their incidence is said to be high in the districts inhabited by the aboriginals, while in the Punjab the Kulu Valley is the area which is most affected. A report issued by the Government of Bengal in March 1944, on its anti-venereal diseases campaign states that " the incidence of venereal diseases in Calcutta has of late been on the increase. Although correct statistics are not available, the figures obtained by the Director (of the venereal diseases organisation) from the leading medical practitioners of this city are alarmingly high. This increase is attributed to various changes in the social and economic conditions of life of late years ".

123. It will be seen that, while no estimates of the probable incidence of these diseases are given, the opinion held by these different health authorities appears to be that their prevalence cannot be considered to be low, at least in certain parts of the provinces concerned, and that, during recent years, the tendency has been for their incidence to rise. Sir John Megaw's estimate gives a proportion of 37 per thousand of the population as showing signs of infection either by syphilis or gonorrhea, a figure which is sufficiently high to justify a serious view of the situation and to demand that adequate measures should be taken to investigate their probable extent of prevalence in the country and that appropriate measures for their control should be taken in the light of such investigation.

The Treatment of Venereal Diseases

124. The information given here is based on the replies to the questionnaire to which we have already referred. In all provinces these diseases are treated along with others in the larger hospitals. In certain provinces, however, special provision for the treatment of venereal diseases has also been made. The extent of such provision varies among the provinces. In Madras, for instance, it is stated that centres providing modern forms of treatment have been established by the Government in the city of Madras and in a number of places in the mofussil. In the city of Bombay there are four such centres maintained by the Government, two by the municipality and another two by the Port Trust.

It is also stated that venereal diseases clinics are working in association with civil hospitals in the mofussil with honorary veneriologists in charge. In the Punjab there are special clinics for these diseases in Lahore, Amritsar and in Ludhiana. On the whole it must be stated, however, that the existing facilities for the treatment of these diseases are insufficient to meet the requirements of the population.

125. Reference may also be made to a matter which is of great importance in the treatment of these diseases. The social stigma attached to them promotes concealment and the quack and his methods of treatment are likely to play an even more disastrous part in the treatment of these diseases than in the case of others. In certain countries the prohibition of treatment of venereal diseases by all except those who possess a registerable medical qualification and the restriction of advertisements regarding specific remedies and other forms of treatment to those approved by the health authority have been found useful in making the campaign against these diseases effective. In India no such restrictions exist at present.

Training Facilities for Doctors

126. The replies to our questionnaire show that, except in Madras and Bombay, no training facilities for doctors in the diagnosis and treatment of venereal diseases have been made available.

Compulsory Notification

127. Legal provision for the compulsory notification of these diseases does not exist anywhere in the country. Opinion as to the value of such a measure is divided even in those countries in which the venereal diseases campaign has been raised to a high level of efficiency. The opinion is held that, in view of the widely prevalent desire on the part of patients and their relatives to conceal the occurrence of these diseases, compulsory notification will lead more to concealment than to the active co-operation of the people with the authorities in securing early and adequate treatment for the infected persons. Indeed, the experience of England seems to point to the possibility of an effective control of these diseases being achieved, under normal conditions, through the provision of extensive facilities for free and confidential treatment, without having recourse to compulsory notification.

HOOKWORM DISEASE

128. This is a disease which has received considerable attention from health authorities in many parts of the world. Probably the most notable enquiry into hookworm infestation was that conducted by the Rockefeller Foundation in the early part of this century in the Southern States of America. To that enquiry and subsequent ones carried out in other parts of the world by the same organisation we owe the fact that our knowledge concerning the cause, prevention and treatment of this disease may be held to be complete

129. The male and female worms live in the human intestine. Large numbers of eggs of the worm are passed out in the stool and, in the absence of sanitary arrangements, are deposited on the ground. These eggs hatch and the larvae that come out continue to live in the soil, if favourable conditions of moisture and heat are present. When persons walk barefoot through such infected soil the larvae gain entrance through the pores of the skin and, after a complicated journey through the blood stream and the lungs, gain entrance into the intestines. Having completed growth by that time the worms become attached to the intestines. They produce their harmful effects partly by the loss of blood caused to the human host through their feeding on him, partly through causing a state of irritation in the bowels which interferes with the digestive function and partly through the secretion of a poisonous substance, which prevents the clotting of blood and thus promotes bleeding. The effects of infestation by hookworm have been well described in the report for 1917 of the International Health Board of the Rockefeller Foundation. Here is what the report says:—

> "Hookworm disease is never spectacular like yellow fever or pernicious malaria. And for this very reason it is the greater menace. Acute diseases sometimes tend to strengthen the race by killing off the weak; but hookworm disease, working so insidiously and frequently escaping the attention even of its victims, tends rather to debilitate the race by attacking the strong as well as the weak. The cumulative effects of the disease on the race—physical, economic, intellectual and moral—which are handed down from generation to generation through long periods of time, are even more important than its contribution to the death roll among individuals. This one disease, where the infection is practically universal, may go far towards explaining the retardation of backward peoples."

130. Many investigations have been carried out into hookworm disease in India, among which special reference may be made to a systematic survey by Chandler in the years 1925-27. The distribution of the disease is as shown below:—

(1) heavily infested areas are Assam, the Dooars and Darjeeling, Travancore, South Kanara and indeed all the tea gardens of South India and the tea and coffee plantations of Coorg;

(2) moderately heavy infestation exists in Central Bihar, the eastern parts of the United Provinces and along the foot-hills of the Himalayas;

(3) it is believed that about 60 to 80 per cent. of the population of Bengal, Bihar, Orissa, the Eastern parts of the Central Provinces, certain areas in the United Provinces and the Punjab, and east coast of Madras are infested with this condition, the average number of worms per individual, however, being not large;

(4) the infestation elsewhere in India is low.

131. The fact that the disease is so prevalent in mines and on plantations is a grave reflection on the sanitary control exercised by the authorities responsible for labour in these areas. We have elsewhere recorded the unsatisfactory conditions of sanitation that exist in the coal mines and plantations of India and it remains to remark here that unless and until these are improved, many millions of people will continue to suffer unnecessarily from this disease.

FILARIASIS

132. This disease is caused by the introduction of the embryo of a small worm known as filaria which is conveyed to human beings by mosquitoes. The prevalence of two types of this infestation has been noted in India, Filaria bancrofti and Filaria malayi. The former is more widely prevalent than the latter, which was first discovered in the Dutch East Indies some years ago and was shown, by Indian workers in this field, to be present in scattered areas in certain parts of India, namely, Travancore, Balasore, Patnagarh and East Bengal. The transmitting agents in the two cases are two different types of mosquitoes, whose methods of breeding are different. The disease is widely prevalent in certain parts of India. It leads to the permanent swelling of the legs and of certain parts of the body besides causing recurring attacks of fever and inflammation of the lymphatic system. Although the disease does not cause death it is responsible for a considerable amount of preventable suffering and disability.

133. Bengal is among the most heavily affected provinces in India. Both in Bihar and Orissa the disease is widely prevalent. Areas of moderate incidence exist in the districts of Tanjore, Kistna, Godavari and Vizagapatam in the province of Madras as well as in Saidapet, adjoining Madras City. The coastal tracts of Malabar and South Kanara districts and of the States of Travancore and Cochin are areas of high incidence. The control of this condition depends on the prevention of the breeding of the carrier species of mosquito and, in the areas indicated above, the necessary measures will have to be carried out effectively if the incidence of filariasis is to be definitely lowered.

GUINEA-WORM DISEASE

134. Guinea-worm disease, another non-fatal infection, also causes much unnecessary suffering and disablement in many parts of the country. It occurs mainly in rural areas and agricultural labourers and other manual workers suffer largely in the affected areas. The worm is long and of a milky white colour and it lives beneath the skin commonly on the leg of the patient. A blister develops on the leg or foot and, when it bursts, a red ulcer is formed through which the worm can be seen. When the affected part comes in contact with water, the worm which is packed with embryos passes them into water. The embryos live in clean water for about a week and in muddy water for a longer period. They are swallowed by cyclops, which are small whitish transparent creatures of the size of a pin's head and are generally present in

most collections of fresh water. When a person drinks infected water, the cyclops are killed in the stomach by the gastric juice and the young worms are set free. They then pierce the tissues and enter the human body. It takes about 348 days for the embryo to grow into an adult worm inside the human body. The worm travels into such parts of the body as are likely to come in contact with water. In India it is stated that the worm appears in about 90 per cent. of patients in the legs. They also appear occasionally in other parts such as the arms, chest, back and abdomen. A patient shows generally only one worm at a time but multiple infections do sometimes occur. It is stated that twenty-two worms were removed from one individual from Rajputana at the Calcutta School of Tropical Medicine.

135. From what has been stated above it will be seen that the prevalence of the disease is dependent on opportunities for the infection of water supplies by persons harbouring the worm. In the affected areas step-wells, tanks and other sources of water liable to contamination are responsible for the keeping up of the infection. The destruction of cyclops by the application of adequate quantities of lime to such water supplies has been shown to be effective in controlling the spread of the disease. By boiling the water the cyclops and the embryos in them are both killed. Even straining the water through fine muslin will suffice to remove the cyclops and render the water innocuous. But, from the point of view of permanent relief, it is essential to protect step-wells, tanks and other open sources of water supply from contamination by persons harbouring the worm.

136. Guinea-worm disease is widely prevalent in certain districts of the North-West Frontier Province while its incidence is relatively low in the Punjab. The Rajputana desert is free but many of the States in Rajputana and Central India contain heavily infected areas. In the Central Provinces, Bombay Presidency, Nizam's Dominions and Madras Presidency the disease is prevalent over wide areas. Well watered tracts, with a fairly heavy rainfall such as Bengal, are generally free.

CANCER

137. This is a group of diseases which have had a great deal of attention paid to them in Europe and America. On the other hand, there exists very little reliable information regarding the incidence of cancer in India. The most authoritative pronouncement on the subject has been provided by an investigation carried out by Drs. Vishwanath and Khem Singh Greval working with a grant from the Indian Research Fund Association. They published a series of papers in the Indian Journal of Medical Research. We cannot do better than quote the authors:

> "The age of maximum incidence of cancer in this country is at least ten years earlier than in Western countries and Japan and in the case of cancer of the female generative organs earlier by 15-20 years. In every province, including Burma, the incidence of cancer of cervix falls heaviest on

Hindu women. The incidence of buccal cancer falls heavier on the male than on the female and on Muslims more than the Hindus. This form of cancer has its lowest incidence in the Punjab, where *pan* chewing is not indulged in to the same extent as in other parts of India. Unhappily this habit is growing rapidly in that province as well. Penile cancer is peculiarly a disease of the uncircumcised communities and out of a total of 611 cases noted in biopsy records and 1,080 cases in clinical records, only 17 cases were recorded among Muhammedans in the former series and 29 in the latter.

" In the whole of this enquiry the aetiological roll of irritation in the incidence of cancer has stood out prominently. Whether it was the cervix, the oral cavity, the penis, the skin or the gastro-intestinal tract, the factor of irritation seems to excel all other possible causes and brings the problem of this fell disease within the scope of preventive medicine.

" Although this survey cannot fix decisively the relative position of cancer amongst the causes of mortality in India, it affords sufficient evidence as to its position being not insignificant. It should at least persuade foreign writers on the subject to be less dogmatic about the rarity of this disease in India. The writer of this note believes that if vital statistics were as carefully collected in India as they are in the West and proper allowance made for the number of individuals living per thousand at a given age, the incidence of cancer will be found to be independent of geographical and racial variations."

138. Other competent observers who have stressed the importance of this disease include Sir Leonard Rogers and Major General Sir Earnest Bradfield. The opinion has, however, been widely held, with insufficient justification, that cancer, in most of its manifestations, is comparatively rare in India. Gradually light is being thrown on the incidence of this condition, the setting up of the Tata Cancer Research Hospital in Bombay having given an impetus to investigation into this important field of study. This research and treatment institution has been in existence only for a few years but has already succeeded in gaining for itself a considerable reputation. We had the advantage of hearing the views of the Director of its laboratories, Dr. V. R. Khanolkar, and his assistants when we visited this hospital. He and others competent to express an opinion hold the view that the incidence of the diseases represented by this group in India is not likely to show any considerable variation from the extent of their prevalence in Western countries.

139. The Tata Memorial Hospital is the only institution in the country which is devoted entirely to the study of the diagnosis and treatment of malignant disease. Radium and deep X-ray therapy are available for therapeutic treatment in a very limited number of places in the country. A list of such places will be found in Appendix 20 of Volume III of this report.

MENTAL DISORDERS AND MENTAL DEFICIENCY

Estimate of Persons suffering from Mental Ill-health

140. Conditions of mental ill-health may be divided into two broad groups, (1) mental disorder and (2) mental deficiency. No estimate of the number of persons suffering from either of these two groups of mental conditions is available for India. It may therefore be of advantage to examine such evidence as is available regarding the incidence of these conditions elsewhere and attempt to draw from it inferences applicable to this country. In England and Wales there were, at the beginning of 1937, about 129,750 patients under treatment in the mental hospitals maintained by the various local authorities, who are responsible under the law, for making such provision. This figure gives a proportion of 3·2 mental patients per 1,000 of the population. In America the rate of admission to mental hospitals has varied from 5 to 8 per 1,000 in different years and in different States. In India there is no reason to believe that the rate of incidence of mental disorders is likely to be much less than those for England and the United States. While purely sociological causes may not be operative in India to the same extent as in the other two countries, chronic starvation or under-nutrition, tropical fevers, anaemea and frequent child-birth in women, who are unfit for motherhood, are responsible for large numbers of cases of mental breakdown in this country. Even if the proportion of mental patients requiring hospitalisation in India be taken as 2 per 1,000 of the population, their number will be at least 800,000 in the country as a whole. It does not, therefore, seem unreasonable to suggest that the number of persons suffering from various forms of mental disorder must be at least a million in this country.

141. As regards mental deficiency, an estimate of 8 per 1,000 of the population was made for England and Wales in a report issued in 1929 by the Joint Committee of the Board of Education and the Board of Control on mental deficiency. Even if the rate applicable to this country were half this figure, the total number of mental deficients in India as a whole becomes 1·6 millions, on the assumption that the total population is 400 millions.

These estimates are only conjectural; nevertheless, they help to indicate the magnitude of the problem that mental ill-health constitutes in the country and the extent to which remedial and preventive health measures will have to be developed, if adequate provision for this section of the community is to be made.

Provision for the Treatment of Persons suffering from Mental Disorders and Mental Deficiency

142. In chapter III of this volume we have shown how the existing provision for medical relief and preventive health work in connection with the common forms of sickness is quite inadequate to meet the needs of the people. For mental patients the available facilities are of a still lower order. In this connection it may be mentioned that, at our request, Colonel M. Taylor, Medical Superintendent, Ranchi European Mental Hospital, undertook a tour of

the more important mental institutions in the country and prepared a report for us. It has been published as Appendix 21 in Volume III of this report. He has shown that the functioning of existing mental institutions is, in most cases, far from satisfactory. A list of these for British India, with the accommodation available in each, and the places where they are located is given in Appendix 22. The total accommodation available is about 9,889 beds and, if the States are also included, 10,189. When it is remembered that the probable number requiring institutional care may, on a conservative estimate, be at least 800,000 to 1,000,000 for the country as a whole, the inadequacy of the existing number of beds becomes unmistakably clear.

143. Apart from this, however, an even more important fact is the existing institutions are working at an extremely low level of efficiency. Colonel Taylor says, " the majority of the mental hospitals in India are quite out of date, and are designed for detention and safe custody without regard to curvative treatment. The worst of them—the Punjab Mental Hospital, the Thana Mental Hospital and the Nagpur Mental Hospital—savour of the workhouse and the prison and should be rebuilt ".

144. As regards the medical staff employed in them he states that " seven of the largest mental hospitals in India have men appointed as Superintendents at salaries that a first class mechanic in Tatas Works would scorn, six of them have little or no post-graduate experience or training in psychological medicine ". The subordinate medical staff are also untrained in psychiatry. The number of medical men employed is quite inadequate. He rightly points out that, with one medical officer for 200 patients, only cursory attention can be given to the patients, while the additional duties of teaching medical students, which some of these institutions are required to perform, are also carried out in a perfunctory fashion.

145. The position as regards nursing staff and ward attendants is equally unsatisfactory in most of these mental institutions. Inadequacy of numbers and insufficiency of training both contribute to make the standard of service of an extremely low order.

We do not propose to describe in detail individual institutions. For such details reference may be made to Colonel Taylor's report.

Facilities for Mental Training for Medical and Other Personnel

146. From what has been said above it will be clear that the need is urgent for providing training facilities for medical and non-medical personnel on as extensive a scale as possible. The staffing of existing institutions with qualified workers and an expansion of mental health activity in institutional and other fields will become possible only with a large output of trained personnel. At the same time it will be recognised, from the brief description given above of the working of existing mental institutions, that the large majority of them are ill-equipped to discharge teaching functions properly. One of the purposes of the tour which Colonel Taylor undertook at our request was to make an estimate of existing

training facilities in the mental institutions in the country. In his view such facilities exist on a reasonable scale at Bangalore and in Ranchi. At other places, *e.g.*, Calcutta and Bombay, a considerable improvement of certain existing institutions and the establishment of well staffed and satisfactorily equipped mental hospitals will be necessary to provide the conditions essential for developing them as proper training centres. These and other matters relating to the creation of training facilities in different parts of the country will be considered when we put forward our proposals for mental health services in the second volume of this report.

CHAPTER X

ENVIRONMENTAL HYGIENE

1. In this chapter we shall deal with environmental hygiene under four heads, (1) town and village planning, (2) housing, (3) water supply and (4) general sanitation.

TOWN AND VILLAGE PLANNING

Introduction

2. The purpose of town and village planning is to utilise the available land to the best advantage of the community, taking into consideration its various needs such as the provision of land for residential purposes, the development of agriculture and industries and the creation of recreational facilities. As has been pointed out by Mr. U. Aylmer Coates, Provincial Town Planner to the Government of the Punjab, town planning is " not merely a matter of planning streets or placing restriction on the size of sites attached to various types of buildings but is, broadly speaking, the allocation of land to its best economic use, the proper relation between buildings of different use and design, the improvement of existing conditions of habitation and securing that development functions both from the utilitarian and sanitary points of view and is also artistically satisfying ".

History of Town Planning in India

3. A short history of town planning in the country will be found in the " Report on Town and Village Planning in India " by Mr. B. R. Kagal in Appendix 24 of Volume III of this report. The report of Mr. Kagal was based on his studies of town and village planning activities in the provinces and in the Indian States of Hyderabad, Mysore and Baroda as the result of a rapid tour undertaken at our request. Mr. Kagal points out that the Government of India began to take an interest in the subject in 1912 when the question of the selection of a site for the new capital in Delhi was under consideration. At the same time, it impressed on Provincial Governments " the great and growing importance " of town planning and suggested the enactment of legislation similar to the English Housing and Town Planning Act of 1909. In the years that followed active interest in town planning developed in the provinces also. Professor Sir Patrick Geddes and Mr. H. V. Lanchester, two leading town planners in England, visited India and advised the provinces of Madras and the Central Provinces and Berar and the States of Baroda, Gwalior and Indore on their respective planning problems. The United Provinces employed a full-time architect who prepared a master plan for Cawnpore. Another English town planner, Mr. E. P. Richards, prepared a report on the town planning of Calcutta and its surroundings. In 1921 the University of Bombay established a School of Sociology and offered its first professorship to Sir Patrick Geddes. In the mean time provincial town planning legislation had also begun to develop, an Act having been passed in 1915 in Bombay, in 1919 in the United Provinces, in 1920 in Madras and in 1922 in the Punjab.

4. After 1921 interest in town planning steadily declined in India, except in the Punjab and in the States of Hyderabad, Mysore and Baroda. As has been pointed out by Mr. Kagal " the interest taken by the Government of India from time to time was an ' occasional burst of insight ' and was not sustained, and so was the response. The initiative for the town planning movement was taken by the Government ' from the top ' instead of its coming ' from below ', as in the case of England where the lead for reform in town and country planning was given by the public, the P.E.P. (Political and Economic Planning), the Town Planning Institute and the Royal Institute of British Architects. The Government accepted the lead and followed it up with necessary enquiries and legislation. In contrast, the Central and Provincial Governments in India have not taken adequate steps even to implement the recommendations made by the Holland Commission in 1918 on the scientific and technical aspects of town planning and by the Whitley Commission in 1930 on town planning legislation. As a rule, the Provincial Governments have not shown any active interest in the subject until recently when post-war problems came to the fore ".

5. In the States of Hyderabad and Baroda selected persons were sent abroad to study the theory and practice of town planning for a period of years and, on return, they were given full opportunities for developing town planning in these States with the co-operation of the public health and other departments of Government. In Mysore, on the other hand, foreign experts were brought in and the main town planning activities have been confined to the two cities of Mysore and Bangalore. No attempts have been made to train local people either by sending them overseas for the requisite specialisation or by instituting appropriate courses in the Mysore University. Thus when the present experts leave the State the likelihood of planning activities continuing to develop are definitely less in Mysore than in the other two States.

Village Planning

6. Even less attention has been paid to village planning in this country than to town planning. Most villages have grown in a haphazard manner and, in far too many cases, it would be beyond the capacity of a planner to improve existing conditions to any reasonable extent. To indicate how difficult such planning would be we may describe the layout of existing villages in certain provinces. In the United Provinces the villages are usually fairly compact, but no regular streets have been laid out and the houses are built with little relation to one another and facing in any direction. In Delhi province village streets are not well laid out and they scarcely justify the term " street ". In Orissa villagers construct their houses without any consideration to the requirements of sanitation and without paying attention to the relationship of one house to another. In the Punjab no provisions exist in the District Boards Act to regulate the construction of houses in rural areas. Detailed instructions have, however, been given in the Punjab Colony Manual with regard to the selection of

village sites and the way in which villages in colony areas are to be laid out. Type plans have been prepared for houses of different kinds suitable for village construction.

Planning in Urban Areas

7. As regards towns, progress in town planning has been extremely slow. During the last 20 or 25 years although, as has already been pointed out, certain eminent town planners visited India and offered advice to Provincial Governments and, in certain cases, even prepared definite schemes for individual cities, very little action has been taken. In some of the larger cities in the country Improvement Trusts have been working for some time and, although their specific purpose is to assist in the planning of these cities, the results achieved have been very limited. We shall now refer briefly to what has been done in individual provinces and cities.

8. *Calcutta.*—The activities of the Calcutta Improvement Trust are confined mainly to the acquisition of land, the laying out of roads and the development of areas in order to sell them outright to purchasers. During the existence of this Trust it has not, as far as we are aware, undertaken any housing schemes at all, although provision for the re-housing of those who will be deprived of their houses by slum clearance operations should be an essential function of a trust. It is understood that the regulation of building construction on the cleared areas has, throughout, been the responsibility of the Calcutta Corporation and laxity in the enforcement of building byelaws has led, in some cases, to the creation of congested conditions in areas which had previously been subject to slum clearance at the hands of the Improvement Trust. So far as the interest evinced in the orderly development of the city is concerned, we may refer to the fact that Mr. Kagal reported that no copy of the comprehensive report on the planning of the city which was prepared by Mr. Richards in 1915, to which we have already referred, could be obtained in the office of the Calcutta Improvement Trust.

9. *The United Provinces.*—It is understood that the Allahabad Improvement Trust has provided new roads in certain congested areas. The Lucknow Improvement Trust has developed some sites. The Improvement Trust in Cawnpore city has started large scale housing projects for labourers which we saw during our tour and we consider the scale of accommodation insufficient and ventilation defective. Sanitary amenities are inadequate. The Superintending Engineer of the Public Health Department in that province has pointed out that the projects undertaken by these Trusts do not obtain the technical approval of any responsible engineer or officer of the Government, particularly in so far as drainage and sewage proposals are concerned.

10. *The Punjab.*—In this province there is a provincial town planning officer who acts as adviser to the Lahore Improvement Trust. Planning schemes for unbuilt areas have recently been prepared for this city, but they have not so far been put into operation. It is understood that both Amritsar and Lyallpur have

submitted town planning schemes to the Provincial Town Planner for approval. The latter has since his appointment prepared, it is understood, schemes for 22 areas and has also considered 132 schemes relating to 25 towns in the province. Reference has already been made to the Punjab Colony Manual which deals chiefly with the layout of village sites in areas under the control of the Irrigation Department. The rules which have been framed are satisfactory, but as far as we are aware, no attempts have been made to prescribe a standard type of building for these areas. As long as the grantee fences his compound with a wall and constructs something which may be called a house, the details of architectural design are left for individual taste to decide.

11. *Bihar.*—In Bihar an Improvement Trust was set up by the Provincial Government in 1915, but the success achieved has been meagre. It is, however, gratifying to note that the Provincial Government is now taking up energetically a suggestion made to it by a Commissioner of one of the Divisions in the province. The proposals now under consideration contain certain features which can, with advantage, be copied by other provincial authorities. These are (1) insistence on a twelve month programme in the case of superseded municipalities; (2) legislation for the provision of executive officers with statutory powers in specified municipalities; (3) a joint provincialized service of executive officers for municipalities; (4) stricter supervision by Government in regard to the enforcement of building byelaws and (5) the provision for the constitution of water works committees in all municipalities which have a piped water supply.

12. *The Central Provinces.*—The Government is, it is understood, considering a town Planning Act after an investigation of existing unsatisfactory conditions in the capital city of Nagpur and in other places. The idea is that a provincial body deriving its authority from a special Act should proceed to plan and direct, in a unified and co-ordinated manner, the development of town planning activities in the province as a whole. While this is certainly commendable, it is understood that a draft Town Planning Act, which has been prepared, has taken the Bombay Town Planning Act of 1915 as its model. The latter is out of date and does not contain even certain important provisions in the Madras Town Planning Act of 1920. Indeed, the Whitley Commission in 1930 suggested that Bengal and Bombay should have Town Planning Acts on the model of Madras. In the circumstances it is difficult to understand why the Bombay Act should have been taken as the model.

13. *Madras.*—Although the province of Madras is unique in having an elaborate Town Planning Act and a Public Health Act, which also contains provisions relating to town planning, the actual standard of performance has been disappointing. Mr. Kagal has pointed out, in appendix XIV of his report, that "the important section in the Madras Town Planning Act is Section 8 which makes it obligatory on certain Councils to make general town planning schemes not later than 31st March 1934.....By November 1944, not a single Municipal Council in the Province, out of 89

including the City of Madras, has submitted the general town planning scheme contemplated by section 8 ".

14. The province originally had a Director of Town Planning. This fact was commented upon favourably by the Royal Commission on Labour in India and was held forth as an example that " other provinces might well follow ". In 1934 the post was reduced to that of a second class officer and a candidate possessing the minimum qualification was appointed in 1935. In 1938 it was abolished on the somewhat extraordinary ground that " the general principles of town planning are now fairly well understood and it should be possible for the town planning committees (Municipal Councils and Local Boards) to apply them in individual cases of planning and development with the advice of the Inspector of Municipal Councils and Local Boards and *ex-officio* Director of Town Planning ". This combined office is held by an officer belonging to the Indian Civil Service with no technical competence to advise on town and village planning. It is clear that the provincial authorities have failed to recognise the importance and technical nature of the duties that the Town Planning Director should perform. The comments of Mr. Kagal on town planning activities in Madras are worth quoting: " Madras has a lesson to teach. Unless Government attitude is more positively sympathetic and helpful, unless municipal administrations are more efficient and show better civic responsibility, the best town planning legislation will be unable to produce the desired results ".

15. From what has been said in the preceding paragraphs it will be seen that, in the country as a whole, the question of town and village planning has so far failed to receive the attention it deserves. In the case of Madras, failure to put into operation the existing legislation has been largely responsible for the present state of undeveloped activity in this field. We also consider that, unless Provincial Governments are prepared to employ competent technical advisers little advance will be made. Provision for such technical guidance will be required not only at the headquarters of the province but also in the larger urban centres in which Improvement Trusts or other organisations are carrying out planning operations. In the past the civil engineer in the Public Works Department has been considered competent to deal with town planning. Town and village planning constitute activities for which special training is essential and until competent technical guidance is made available, progress in this field will continue to be unsatisfactory. The Central Provinces Government has put forward a valuable suggestion that a provincial body should be established which, deriving its powers from a special Act, should guide and co-ordinate town and rural planning activities in the province as a whole. This idea may, with advantage, be adopted in other provinces also. Lastly, planning involves expenditure, often on a large scale, and Provincial Governments will have to shoulder the responsibility of promoting developments in this field by suitable grants-in-aid to the local bodies or other authorities which are entrusted with the task.

HOUSING.

16. Existing housing conditions are, generally speaking, extremely unsatisfactory in rural and urban areas. The growth of housing accommodation in the country has not kept pace with the increase in population and over-crowding is therefore a common feature, particularly in the towns and cities. In addition, the requirements of sound hygienic construction have largely been neglected, while the state of insanitation that exists in towns and in the countryside helps to reduce still further the value of the home as the place which should provide reasonably satisfactory living conditions for the maintenance of the health of its inmates. Proper housing has a profound influence on the health of the people. We may, in this connection, make specific reference to three groups of diseases, namely, tuberculosis, venereal diseases and bowel complaints such as dysentery, worms and typhoid, the incidence and spread of which are profoundly affected by the housing conditions of a community.

17. Before describing briefly housing conditions in the rural areas, we shall make certain general remarks. The materials for house building, which are commonly used by the poorer classes throughout India, namely, mud and bamboo matting, are not in themselves undesirable. They have the great advantage of being cheap and they can, with a little care, be so used as to produce a respectable house. The common thatched roof brings with it the danger of vermin and of insects as well as a continual threat of fire. When sensibly utilised and properly supervised, however, a thatched roof can be made reasonably serviceable. In many parts of India tiles are not easily procurable. While therefore the poor man's dwelling, although it be a structure of mud walls and thatched roof, need not necessarily be unsatisfactory from the point of view of comfort and of hygienic construction, there are certain other essential requirements which must be met. These include the provision of more than one room to each house, the exact number depending on the size of the family, separate cooking accommodation with provision for leading away smoke and washing facilities. Adequate light and ventilation should also be provided. Further, the demands of sanitation require that there should be a latrine for each house. We have indicated elsewhere that, in many parts of the country, a cheap solution to this has been found in the provision of bore-hole latrines. We consider these as the minimum requirements of a habitable house. Further improvements, if possible, may include a small garden properly fenced in for privacy and opening on to a decently metalled village road. There should be provision for the disposal of manure and garbage as well as for the maintenance of the village cattle, goats and poultry, these being arranged, as far as possible, on a common basis for the community as a whole.

18. The requirements we have suggested above for developing rural housing conditions on a reasonable basis can hardly be considered extravagant. As against this standard we may now describe existing conditions in the rural areas in certain provinces. In the United Provinces no attempt has so far been made to control rural

housing. The usual type of house consists of a court-yard with rooms which may be entered from it. There are generally no windows. The material used for construction is mud with a thatched or occasionally tiled roof. A separate latrine for a house is rare. Food is usually prepared and eaten in the court-yard, though occasionally a room may be set aside as the kitchen. In this and in other provinces it is a common practice for the villagers to permit cattle, goats and other domestic animals to share the available living space in the house with human beings. In the Punjab no provisions exist in the District Boards Act to regulate the construction of buildings in rural areas. It is understood, however, that steps are being taken to rectify this defect. In the rural areas of Bengal houses are generally built with mud walls or occasionally with bamboo matting. Windows are provided but they are insufficient in size. Latrines are rarely found. A common feature in this province is the *doba* or tank attached to each house or a group of two or three houses. The villages are scattered over a wide area and communication between houses is often very difficult. Indeed many villages, particularly in eastern Bengal, are completely isolated for prolonged periods during the monsoon. Rural housing conditions in Bombay are also very primitive and the conditions of insanitation that prevail are quite unsatisfactory.

Urban housing

19. Housing in urban areas in India is also very unsatisfactory. The enforcement of building byelaws in municipalities hardly exists. A typical reply to our enquiry about the enforcement of these byelaws was that received from the Director of Public Health of the Central Provinces. He said that " municipal committee members will not incur the risk of being unpopular through the enforcement of these byelaws ". So long as local health authorities continue to maintain this attitude the enforcement of the law for improving existing housing conditions will be impossible.

20. We would also draw attention to certain other matters in this connection. We have been informed that, in the United Provinces, plans for the construction of houses in urban areas need not be approved by the Health Department of the municipality concerned. That department is responsible only for the location and specification of wells and sanitary conveniences. The Provincial Government has issued model byelaws laying down standards regarding open spaces, light, ventilation and sanitary equipment. But these are, as a rule, not enforced by the municipal boards. Health departments have no legal powers to prevent the use of houses unfit for human habitation, nor are they empowered to inspect the existing dwellings with regard to space, lighting, ventilation and sanitary arrangements. It would therefore seem that the authority primarily concerned with promotion of the public health has been excluded from exercising that supervision which is essential to ensure the maintenance of satisfactory standards. We understand that, in the large city of Agra, there were no building byelaws till July 1944 and that, since then, they have been applied ineffectively. In Orissa the Municipal Acts do not provide for the framing of

building byelaws. Building plans are examined by the public health and engineering departments of municipalities, where these exist. But the recommendations of these officers are, it is understood, generally ignored. In Bihar, of a total of 57 municipalities, 33 have adopted the model building byelaws which have been framed by the Provincial Government, but 24 have so far taken no steps to enforce them and, as far as we are aware, nothing has been done to rectify this negligence of a public duty. Here also, we understand that health officers have no powers for controlling the use of houses unfit for human habitation and for inspecting existing buildings as regards their sanitary condition. In the Punjab nearly all local bodies have adopted approved building byelaws but their observance is far from satisfactory owing to the lack of suitable supervisory staff. In Madras a housing survey recently carried out in Madura city revealed that 1,900 houses were overcrowded and that 2,500 were one-room tenements harbouring ten to fifteen families in each. In Coimbatore, a town in which it has been estimated that the population has increased by 170 per cent. during the past half a century, housing accommodation has grown during the same period to the extent of 20 per cent. The consequent overcrowding on the available housing accommodation can well be imagined. In Bengal we understand that building byelaws are applicable only in 44 municipalities and that, even in these, their enforcement leaves much to be desired.

21. In this gloomy picture there are a few bright spots. In Delhi Province a housing scheme was started some years ago, which we consider satisfactory in design, although we cannot but state that it should have been more energetically developed and that the houses under the scheme should have received more care and attention from the authorities concerned as regards the quality of their construction. The scheme is intended to re-house persons dispossessed of their homes as the result of slum clearance operations and, in order to make it financially sound, a subsidy has been made available by the Delhi provincial authority. Three types of dwellings are provided in the scheme, a one-roomed house for a family of not more than 3 adults, a two-roomed house for families of 3—5 adults and a three-roomed house for those having more than 5 adults. The first and second types are capable of expansion into the three-roomed class. The single-room house covers 102 sq. ft., the two-room type 204 sq. ft., and the three-room one 300 sq. ft. For each type of dwelling there is a cooking verandah and a bathing platform, the latter being connected with an outside surface drain. A fire place and flue are provided in the cooking verandah. We do not approve of the one-roomed house. We noticed that there was overcrowding, an insufficient water supply and an insufficient number of public latrines for this class of houses. While commending the idea underlying the scheme our criticism is that the Delhi Improvement Trust should have devoted more money and care to its details. We have already referred, in the chapter relating to industrial health, to a housing scheme promoted by the Madura Mills at

Harveypet, in which houses are built semi-detached, each consisting of two rooms with a verandah, a kitchen, a small store room and separate latrine. We are specially referring to these two schemes as attempts to deal with urban housing problems, because we desire to see that all provincial authorities become interested and devote adequate attention to a subject, which, from the point of view of the health and general well-being of the community, is second to none among the problems awaiting solution in the post-war period.

22. To sum up, in rural areas there has been, up-to-date, no planning and no control of housing. In municipal areas legal supervision exists for enforcing desirable standards of housing but these powers are not being used satisfactorily by the municipal commissioners concerned. The health department, which is intimately concerned with the maintenance of certain minimum hygienic standards, has not, generally speaking, been permitted in the past to exercise adequate control over either existing housing or new construction. In addition to these grave defects in the enforcement of the law relating to housing, all available evidence seems to point to the growth of population having far outstripped the development of new housing accommodation, the consequent deficiency having produced acute conditions in some of the larger urban centres.

WATER SUPPLIES.

23. The provision of a safe water supply should receive the highest possible priority from the administration responsible for the welfare of its people. This has been recognised by every civilised country in the world. Many have yet to fulfil adequately their responsibility in this connection but few have as much leeway to make up as the Governments in India. The provision of a safe and adequate water supply is a basic requirement, the importance of which cannot be over-emphasised, and this remark applies with special reference to a tropical country like India which is subject to epidemic waves of water-borne diseases of great magnitude.

24. The percentage of population, urban and rural served by protected water supplies is 6·6 in Madras, 7·3 in Bengal, 4·1 in the United Provinces and 9·0 in the North-West Frontier Province. In Orissa there are only two towns in which protected water supplies have been provided while, in Sind, there are five. In the Punjab the percentage of population served with protected water supplies is 57·5 in urban areas but, in the rural areas of this province, the proportion is only 0·8 per cent.

Urban Protected Water Supplies

25. The majority of the urban areas do not enjoy the benefit of safe water supplies. It is only the larger towns and cities which possess them. In these towns the supply is usually intermittent while the quantity per head per day varies from 2 to 25 gallons. Calcutta is unique in that there are two water supplies, one of treated water and the other of untreated. Many of the urban supplies were designed some time ago and are quite out of date.

Some remained in the planning stage for 10 to 20 years and, by the time they were executed, were insufficient for the population for which they were designed.

26. It seems desirable at this stage to give some indication as to what may be considered an adequate supply of water for a municipal community. Obviously this must vary with the type of population concerned. Thus, in an industrial town, more water should be supplied than in a largely residential city. In Western countries the average overall quantity which is considered essential for domestic purposes is 25 gallons per head per day, but larger quantities are consumed in many towns, particularly in the United States of America. As a general principle it seems reasonable to state that for most towns in India, other than the more highly industrialised cities, a supply of about 35 gallons per head per day would be adequate considering the variations in climate over the whole year. This quantity will have to be increased considerably for large industrial cities such as Ahmedabad, Cawnpore, Calcutta, etc. For these a figure of 60 gallons per head per day would not be unreasonable.

27. Calcutta, Madras, Bombay and Poona maintain laboratories for the examination of piped water supplies, while arrangements have been made in the United Provinces for the testing of samples of water from five of the largest towns in that province. Methods of purification of water vary. In most of the older water supplies slow sand filtration is employed, a system which has not been satisfactory in operation largely because these filters have been badly maintained and operated. Rapid sand filtration has been installed in several cases—Hyderabad, Cawnpore, Agra, Lucknow, Allahabad, Calcutta and Madras—and this method is gaining popularity.

28. The initiative lies on the local body concerned to press for a protected water supply. The Provincial Government, on receiving a request for technical and financial assistance from a local body, directs its Sanitary Engineer to investigate and put up estimates for a water supply scheme. If these are accepted by the local body and if it agrees to find its share of the capital cost and maintenance charges from its own resources, Government makes a grant-in-aid which varies in the provinces from 33 per cent. to 50 per cent. Government may even advance the share of the local body as a loan. The actual construction is then carried out under the supervision of an Engineer of the Public Works Department and, on completion, the works are handed over to the local body. This passive attitude on the part of Government and lack of initiative on the part of local bodies have played a large part in making the development of protected water supplies extremely slow in this country.

29. Two other matters relating to urban water supplies require mention. One is the common practice in municipalities of permitting a large waste of water through failure to instal meters for regulating supply. We recognise that the poorer sections of the population should receive adequate supplies without having to pay for them. Even after making due allowance for this, we are

convinced that there is ample room for controlling waste through the installation of meters in appropriate places. The other is the general practice of diverting any profits which may accrue from water to the general funds of the municipality instead of earmarking even a portion of the amount for improvements to plants or to the augmentation of the supply.

Rural Water Supplies

30. The source of supply is mostly from wells, tanks, rivers and streams and these are generally unprotected. Until quite recently (approximately 1930) very little attention was paid to this problem by the Governments in the country. Comparatively recently a Fund has been created to deal with this problem in some provinces. Bengal, for example, spent nearly Rs. 50 lakhs in tube wells in rural areas with the idea of combating cholera but left their maintenance to local bodies. The result is, we understand, that some 50 per cent. of these tube wells need major repairs, while 20 per cent. are completely derelict. In 1937 the Government of Madras formulated a comprehensive scheme of development for rural water supplies and constituted a Rural Water Supply Fund to which yearly contributions were to be made. A comprehensive ten-year plan was worked out but, unfortunately, before it was brought into operation the outbreak of the war put a stop to its progress. It is to be hoped that this important subject will receive early consideration in this province during the post-war period.

31. The importance of establishing an all-India body to deal with water conservation over the country as a whole and to recommend to the authorities concerned an equitable distribution of water among the different provinces was stressed by a number of persons. These include the Superintending Engineer of the Public Health Department of the United Provinces, Dr. Gilbert Fowler, the Chief Engineer, Calcutta Corporation and the Professor of Public Health Engineering in the All-India Institute of Hygiene and Public Health, Calcutta. Of these the first drew special attention to the disastrous effects of the unregulated depletion of the waters of the Jumna and the Ganges by the Irrigation Departments of the Punjab and the United Provinces. As a consequence, the water supply of Agra and Cawnpore has been seriously affected during the summer months, while the river pollution problems resulting from the discharge of trade waste into these rivers have become aggravated.

GENERAL SANITATION.

Disposal of Nightsoil

32. We shall consider, along with the collection and disposal of nightsoil, the collection and disposal of sewage. The history of sanitary developments in Western countries shows that it was agitation for the provision of pure water and proper disposal of excreta which led to the general improvements now achieved. The first town in India to have an underground sewage disposal system was Calcutta, it having been introduced as far back as 1870. In spite of this early start, the development of the sewerage system in

India has been very slow, even slower than the provision of protected water supplies. Broadly speaking, the collection and disposal of excreta is a service confined to municipal towns only and by no means to all of them. For a number of even the larger urban cities, this service is at present of a low standard. Nightsoil is removed, in such towns in certain provinces, in baskets by "customary sweepers" and deposited along with other rubbish in "dalaos" or enclosures situated in public places. These "dalaos" are cleared later and the nightsoil is transported in special carts for the purpose. Sometimes these carts are in bad repair and leak on the road. The "dalaos" are, of course, magnificent breeding grounds for flies and the result is that all establishments in their immediate vicinity are under constant threat from these noxious insects. The actual disposal of nightsoil is generally by trenching which, in few municipalities, receives adequate supervision. Repair shops for nightsoil carts are maintained at Calcutta, Bombay, Madras, Madura, Delhi and other large cities, but there are numerous municipalities which do not maintain this elementary service. Composting has been tried of recent years in some towns and considerable progress has been made with this method of disposal, particularly in Madras. Where it can be and is practised properly, it is a process which reduces fly breeding considerably and results in valuable manure the use of which by local farmers can be slowly popularised.

33. Even in those towns which are provided with sewers it by no means follows that all the latrines are connected to the sewers. In such places, among which we may quote Madras, Calcutta, Dacca, Lucknow, Hyderabad (Deccan), the system is that nightsoil is collected in carts from areas not connected with the sewers and dumped into the sewers at places known as 'pail depots'. In the municipal areas of Agra, Lucknow, Cawnpore, Allahabad, all in the United Provinces, no conservancy tax is levied except on people living in the Civil Lines and these local authorities do not seem to consider it their duty to collect nightsoil from untaxed houses, with the result that the service which such houses receive is of a very low standard. In most provinces the number of public latrines in municipal areas is far too small for the needs of the population. In most municipalities the collection and disposal of nightsoil is a duty of the Health Department though, in some, the responsibility is laid on the Engineering Department.

34. Before we leave this subject of excreta disposal in towns we may give, for a few provinces, the number of sewered towns that exist. In Madras there are three, in the United Provinces five, in Bengal eight, in the Central Provinces one and in Bihar two. The total population living in areas normally served by sewers is probably only 7 millions. There are indeed many cities of over 100,000 population without this elementary amenity and, even where the underground system exists, it often serves only limited sections of the population. For example in Allahabad the Civil Lines are not sewered at all and in the main city a large proportion of the houses is not connected with sewers. In Dacca a

sewerage system, which was designed for a population of 45,000, has not been remodelled for the present population of 250,000.

35. The methods of disposal of sewage vary. Sewage farming is practised in the sewered cities of the United Provinces, Poona, Karachi, Mysore and some other cities and, on the whole, the system has been working satisfactorily. The 'activated sludge' process is in use in Delhi, Jamshedpur and a few other places. Bombay has an up to date modern treatment plant for a part of the city. The cities of Bombay and Madras dump a part of their sewage into the sea but the outfalls are badly located.

36. Nowhere have standards been developed for the quality of sewage effluents which can be safely discharged into natural waters. In Bengal septic tank effluents are required by law to be sterilised before being discharged into rivers. There is a Septic Tank Inspector in the Public Health Department, who collects samples of sewage effluent once a year in order to see that the law is enforced. Such inspections naturally fail to produce any material improvement.

37. In rural areas, with the exception of a few demonstration centres set up by certain Public Health Departments, it may be stated as a broad generalisation that no system of collection and disposal of excreta exists. In certain Panchayat and Union Board areas a small number of latrines of a primitive type are provided. Even in many municipal areas varying proportions of existing houses have no latrines and new houses are permitted to be built without latrines by the local authorities concerned. These general remarks must be qualified by the statement that limited attempts have been made in certain areas to promote proper nightsoil conservancy. Probably the largest advance has been made in the province of Madras. Here the rural sanitation unit attached to the Public Health Department has been promoting the development of the water carriage system in rural areas. Septic tank latrines have been built for individual houses, with a cheap type of concrete seat with a water seal. Attempts have also been made to popularise hand-flushed public latrines on the water carriage system in some rural areas. In this province and in some other parts of India the popularisation of bore-hole latrines has also been attempted.

The Collection and Disposal of Household Refuse

38. *Urban Areas.*—A common practice in many municipalities in this country is to entrust the collection and disposal of refuse to contractors. The results have not been satisfactory as contractors are mainly concerned with making their profit and not with efficient service in the interests of the health of the community.

39. The actual methods which are in use for the collection of household refuse vary considerably. Public dust bins of varying patterns and efficiency are placed in the streets, often in inadequate numbers, and the householder is expected to deposit in them his household waste. It is only in two or three municipalities that household bins are in use. The contents of the dust bins are emptied into carts and taken away for disposal usually by dumping on land and, in a relatively small number of cases, by incineration. If this system is to be efficient it must be carefully

supervised and controlled. The public bins should be fly-proof and should be emptied of their contents as soon as they become full. These requirements are not met and street bins generally become fly-breeding centres and the happy hunting grounds of pariah dogs. If the transportation carts are not maintained in good repair and are not of a type which permits of the rapid emptying of the bin into the cart and the closure of the cart immediately afterwards, they too become a source of considerable nuisance. Under existing conditions of supervision and control such desirable standards of efficient service are not generally attained.

40. It must be remembered that the general lack of ordinary sanitary conveniences in all the smaller municipalities results in there being present in household waste a varying proportion of nightsoil and the consequence is that the danger to the public health from such collections of refuse is all the greater.

41. Incineration as a method of disposal of household refuse is not practised by most local bodies, probably because of the idea that refuse provides a useful means of filling up and reclaiming low-lying areas. Such reclamation is certainly desirable but the rubbish dumped in must be carefully covered over with sufficient earth to prevent fly-breeding and to permit of decomposition without causing nuisance. The requisite care is not, however, bestowed on this system of disposal with the result that fly-breeding is a common occurrence.

42. There are many municipalities which do not even levy a scavenging tax to cover the cost of a nightsoil and rubbish conservancy service and conditions in these towns are extremely unsatisfactory.

43. *Rural Areas.*—In rural areas no attempt has, on the whole, been made for the collection and disposal of household refuse. In some villages stable refuse is collected and, along with the household refuse, is piled in a backyard to be used subsequently as manure. The presence of nightsoil in such refuse renders the danger to health from such practice all the greater.

44. The lack of scavenging services in rural areas has perhaps helped to popularise bore-hole latrines, but the progress made in this direction has been limited. There are, of course, many places in which bore-hole latrines are not practicable, but large areas exist in which they can and should be developed.

The Disposal of Industrial Wastes

45. This is an important subject which has so far received very little attention. The unsatisfactory disposal of such wastes affects directly, in many cases, the amenities of a neighbourhood. Where an industry is situated on a river, the pollution which results from the disposal of untreated industrial waste into the river can have a profound effect on the use of its water. Owing to the haphazard manner in which industries have been permitted to grow up in urban areas in different parts of the country, much nuisance has been created by the inadequate disposal of waste products from various types of industries. Their adequate control is a matter of importance and urgency.

CHAPTER XI

QUARANTINE, INTERNATIONAL AND INTERNAL

Introduction

1. The idea that certain diseases spread by association with patients and that defilement from contact with them required purification of the person and disinfection of garments and houses dates back to many centuries before the Christian era in Egypt, India and the East generally. Evidence of this is available from the hygienic code incorporated in the Mosaic Law and from certain practices relating to personal and community hygiene enjoined by religious custom in India and adopted by many sections of the Hindus even to-day. But the practice of quarantine seems to have become a recognised measure against the introduction of diseases only in the 14th century. It was first introduced against plague as will be seen from the following quotation from Sir George Newman's book, " The Rise of Preventive Medicine ".

> " When it became obvious to all concerned that plague passed from port to port, and was thus conveyed from the Levant to the coasts of other countries, the great maritime powers introduced a system of quarantine, an initiation of an international sanitary cordon. Venice, the Queen of the Adriatic, began in 1374, and its practice was quickly followed at Ragusa on the Dalmatian coast in 1377 and at Marseilles in 1383. Incoming ships and passengers from the East were trentined and quarantined for thirty or forty days respectively. The ships were opened to sun and wind, and were also fumigated. A hundred years later Venice set apart special sanitary officers at ports to ensure effective quarantine practice."

International Measures to Prevent the Spread of certain Communicable Diseases

2. International measures to prevent the spread of communicable diseases are regulated by two international sanitary conventions relating to sea and air traffic respectively. They are:—

(1) The convention signed at Paris on the 21st June 1926 which relates to sea traffic and

(2) The convention for aerial navigation concluded at the Hague on the 12th April 1933.

These two conventions prescribe that the governments which have accepted them should take action on certain prescribed lines in regard to (1) the communication of epidemiological information regarding their own territories, (2) the export of infection from their sea and air ports and (3) the imposition of quarantine and other measures against persons and goods arriving by sea or air in their territories from infected areas in other countries. An international organisation, the Office International d'Hygiene Publique at Paris, on which the Governments of over fifty countries were represented, was, till 1940, the institution responsible for the formulation of these conventions and for the supervision of their operation. Its Permanent Committee used to meet twice a year to consider quarantine matters of international importance and to make suitable recommendations for adoption by all the participating countries.

The Dissemination of Epidemiological Intelligence

3. Under the 1926 convention each Government is required to notify to other Governments and to the Office International d'Hygiene Publique at Paris—

(*a*) the first recognised case of plague, cholera, or yellow fever in any locality within its territory;

(*b*) an extension of any of these diseases from areas already affected to other areas and

(*c*) the incidence of typhus or smallpox in an epidemic form.

Such notifications are to be followed up by subsequent communications furnished regularly to the Office at Paris so that other Governments may be notified of the course of an epidemic. The infectious diseases recognised for the purposes of the International Aerial Sanitary Convention are also the same.

4. In order to facilitate the dissemination of epidemiological intelligence among the participating countries, the conventions have authorised the Office International at Paris to collaborate with other international organisations concerned with the collection and distribution of such information. The Office was therefore working, in this field, in close association with the Health Organisation of the League of Nations and the Pan-American Sanitary Bureau. Under Article 23 of the Convention of the League of Nations it was provided that States, which were members of the League, should endeavour to take steps in matters of international concern for the prevention and control of infectious diseases. One of the steps taken by the Health Organisation of the League in this connection was the setting up of an epidemiological intelligence service, which consisted of a central organisation at Geneva and of regional bureaux at Alexandria for the Middle East and at Singapore for the Far East. This latter bureau was established in 1925 and collected weekly information from the health authorities of all countries east of Suez and broadcast it from Saigon in French Indo-China and from Malabar in Java for the benefit of ships and of health authorities of the participating countries. To this bureau was sent from India every Wednesday by the Public Health Commissioner, information relating to the incidence of the common infectious diseases, cholera, smallpox and plague. These figures along with similar information collected from other countries were compiled at Singapore and cabled to the Geneva office for transmission to the Office International in Paris.

5. The Pan-American Sanitary Bureau has a permanent executive board with its headquarters in Washington and its functions include, among others, the collection and distribution of information on health matters.

6. As pilgrimages can play a large part in the spread of infectious diseases, elaborate provisions have been made in the International Sanitary Convention, 1926, for the supervision of the health and comfort of pilgrims as well as for the enforcement of such measures as will minimise the possibility of the spread of these diseases. For instance, standards have been laid down for pilgrim ships in

respect of the floor space for individuals, ventilation, the provision of sanitary convenience, cooking arrangements, the provision of wholesome food, water and medical facilities, including the employment of a qualified doctor and the provision of hospital accommodation and the necessary medicaments, disinfectants, vaccines, etc. Vaccination against smallpox and other diseases can be enforced before the pilgrims leave their country, if the necessity for such a measure exists, and there is also provision for health supervision on the onward and return journeys.

Prevention of the Export of Infection from a Country

7. The provisions included in these conventions to control the export of infection from a country are (1) the prevention, by means of a medical examination, of the embarkation by sea or air of persons suffering from any of the five diseases mentioned above and " of persons in such relation with the sick as to render them liable to transmit the infection of these diseases ", and (2) the carrying out of such special measures as may be required in respect of each of these diseases, *e.g.*, the prevention of rats gaining access to ships or aircraft as regards plague, the protection of food and water on ships in respect of cholera and the delousing of suspects before embarkation to prevent the spread of typhus.

Prevention of the Entry of Infection into a Country

8. To prevent the entry of infection into countries instructions have been laid down in the conventions detailing the conditions under which a ship or an aircraft should be declared as ' healthy, infected or suspected ' and the measures to be taken in each case. In addition, each Government is required to make special provision in its larger sea and air ports for an organised health service, which is able to provide medical supervision over the health of the crews of the ships visiting the port and to carry out the preventive measures necessary to prevent the entry of infection into the country, including the transport of patients and their isolation and treatment.

Quarantine Practice in India

9. The Government of India has not yet ratified these International Sanitary Conventions but it has attempted to carry out, even before ratification, many of the obligations imposed by them. One of the reasons why the Government of India had not ratified either of these conventions was that it was first necessary for them to introduce new Indian Port Health Rules and New Indian Aircraft (Public Health) Rules in order to incorporate therein the measures prescribed in the conventions and to set up adequate health organisations at the major seaports and airports in the country. The Indian Port Health Rules were published in 1938 and the Indian Aircraft (Public Health) Rules in 1940. India has seven major seaports and 26 minor ports, from which sea-going traffic proceeds to foreign ports. The major ports are all under the administration of the Government of India, while the minor ports are administered by Provincial Governments as agents of the

Government of India. The major air ports in the country are at Karachi and Calcutta, in both of which there are multiple land air ports as well as marine ports for flying boats.

Special Measures against the Introduction of Yellow Fever

10. The subject of international quarantine has particular importance to India on account of the risk of the introduction of yellow fever. Special measures have been taken to protect against this eventuality and they include, among others, the maintenance, for the immunisation of the people against the disease, of ample stocks of yellow fever vaccine which were made available to the Government of India by the courtesy of the Rockefeller Foundation, New York; the provision of facilities for this vaccination at Bombay, Karachi, Calcutta, Madras, Kasauli and New Delhi; the drawing up of a mobilisation plan to cope with any possible outbreak of the disease and the maintenance of adequate stocks of all necessary materials such as sprayers, pyrethrum extract, etc., for immediate use in any place in India at short notice. The Government of India is advised on the technical aspects of this problem by the Public Health Commissioner who has the assistance of a Yellow Fever Committee, which was brought into being in December 1939 and which has maintained close contact with a similar committee which sits in London to consider the problem from the point of view of inter-Commonwealth traffic.

Quarantine Measures along India's Land Frontiers

11. Control of the spread of infection through land routes can, on occasions, become a matter of the greatest importance as, for instance, at the end of the first World War (1914-18) when large scale epidemics of typhus and relapsing fever threatened to sweep across Europe from Russia. In India land quarantine has so far been restricted to special occasions which have been infrequent. In March 1943 following an outbreak of typhus in Afghanistan, inspection stations for the delousing and segregation of persons were set up along the main routes entering the North-West Frontier Province and Baluchistan. On certain occasions the Government of Afghanistan prohibited, in the past, the entry of persons, who were not protected against cholera by inoculation, into that country from British India.

Internal Quarantine

12. The purpose of internal quarantine measures is to prevent the spread of infectious disease from one administrative unit in the country to another. Any scheme designed to achieve this end should ensure adequate control over the spread of infection between neighbouring Provinces and between the Provinces and the Indian States which lie adjacent to them. No attempt has so far been made to deal with this problem in a comprehensive manner and no organisation exists for the coordination of such preventive measures as individual Provinces and States may carry out in their own territories. In recent years, however, there have been some

developments in connection with preventive measures against epidemics following in the wake of fairs and festivals. Great numbers of these are held at various places throughout India and are attended by people from distant parts of the country. In the past extensive outbreaks of cholera have been associated with some of these festivals. The Government of Bombay led the way in attempting to control the spread of the disease by introducing an indirect form of compulsory inoculation of pilgrims attending the large festivals held at Pandharpur in that province. The enforcement of this measure received considerable support from the authorities of the neighbouring State of Hyderabad (Deccan) and of the Central Provinces and Berar, from both of which large numbers of pilgrims attend the Pandharpur festival. This commendable example has been copied and improved upon elsewhere, and in Bihar, Orissa, Sind and recently in the United Provinces, compulsory anti-cholera inoculation of pilgrims attending important festivals in these provinces was carried out with the active cooperation of different health authorities.

13. *The legal position.*—Under the Government of India Act, 1935, the prevention of extension from one unit of the Federation to another of infectious or contagious diseases or pests affecting men, animals or plants is an item under Part II of the Concurrent Legislative List, so that both the Central and Provincial Legislatures have power to enact laws. The Central Government can give directions to a Province regarding the carrying out, in that Province, of any Central Act relating to the subject, provided the Act authorises the giving of such directions. The actual execution of the necessary measures is a function of the Provincial Government. Failure on the part of a Provincial Government to give effect to any directions given by the Central Government can be rectified by the Governor-General, acting in his discretion, issuing as orders to the Provincial Government either the directions previously given or those directions modified in such manner as the Governor-General thinks proper.

14. When Federation comes into being, the Federal Legislature will have power to make laws on this item under Part II of the Concurrent List in respect of a State which enters the Federation and accepts this item as a matter in which the Federation Legislature can make laws. This power will be subject to such limitations as may have been specified in the Instrument of Accession for the State concerned. Limitations can also be placed on the executive authority to be exercised by the Federation.

15. The power provided for the intervention of the Governor-General in his descretion appears to be capable of promoting action only of such a dilatory nature as to be of little use for the solution of the urgent problems requiring immediate attention, which internal quarantine administration may bring up from time to time. As regards the States, the limitations which may be imposed by the provisions of individual Instruments of Accession in respect of federal legislation and executive action may restrict, even to a greater extent than in the case of the Provinces, the powers of the

Centre to enforce quarantine measures. The existing legal position and the limitations it imposes on the organisation of an effective system of internal quarantine will have to be taken account of in formulating our proposals for the control of the interprovincial spread of communicable diseases. The United States of America afford certain valuable suggestions in this connection and we shall refer to them when we discuss the subject of quarantine in Volume II of this report, which deals with our recommendations.

CHAPTER XII

VITAL STATISTICS

1. Vital statistics form the foundation of all planned health work. "As ultimately preventive and curative work must be organised on the basis of accurate knowledge of the diseases and disabilities in an area, the importance of collecting accurate vital statistics cannot be over-emphasised."* Both the Royal Commission on Agriculture and the Royal Commission on Labour drew attention to various defects in Indian vital statistics and stressed the importance of effecting an early improvement.

2. The term vital statistics can, in its wider sense, include information relating to a wide range of human activities, but it is usually applied to a narrower field covering births, deaths, marriages and the incidence of disease in the community. In India registration of marriage does not take place among the two communities, the Hindus and Mohammadans, who together form over 90 per cent. of the total population. Such statistics as may exist in this country for marriages can therefore relate only to a small section of the population and we shall not therefore refer to them here. We shall confine ourselves to the statistics of births, deaths and morbidity. As regards the last, no country can claim reasonably accurate statistics for the population as a whole, except in the case of certain diseases which are made notifiable by law. In India the available statistics in respect of births, deaths and notifiable diseases are all defective. Such defects are associated partly with the registration of these vital events and partly with their compilation. Before we deal with these defects it may be of advantage to describe briefly the agencies employed in different parts of the country for the registration and compilation of vital statistics.

Agencies for Registration and Methods of Compilation†

3. In towns and cities the municipal authority is responsible for the registration of vital statistics and this function is usually a part of the duties of the health department. In the rural areas the village watchman or the *chowkidar* is usually the reporting agent. In Northern India generally, the registrar is the officer in charge of the *thana* or police station, while in the province of Madras the village headman is the registrar. In those provinces in which the registrar is the police station officer, births and deaths from the different villages constituting a *thana* are registered on specific days of each month, when the *chowkidar* is required to report himself at the police station. The interval between such visits of the *chowkidar* is in some areas a week and in others a fortnight. In areas where the village headman is the registrar, the recording of these events takes place more promptly.

4. As regards infectious diseases, it is understood that, in certain provinces, an outbreak of any of the common infectious diseases has to be reported by the village *chowkidar* immediately to the

* Report of the Inter-governmental Conference on Rural Hygiene held in Java in 1937 under the auspices of the League of Nations.

† Most of the information given under this head and in this chapter generally is taken from the "Memorandum on Indian Vital Statistics" which is incorporated in the Second Report of the Central Advisory Board of Health (1939).

police station concerned, although subsequent events are brought to notice only on the days on which he is required to visit the *thana* headquarters in connection with his routine duties. In the province of Madras, daily reports are required to be sent, it is understood, by the village headmen throughout the course of an epidemic.

5. The procedure in regard to the compilation of vital statistics differs to some extent in the provinces. In Bengal, for instance, the figures for the different rural *thanas* in a sub-division are compiled in the office of the Sub-divisional Officer and then passed on to the District Health Officer who, after including those for municipalities, which he receives direct, submits the figures to the Director of Public Health. In those provinces in which a public health organisation has not been built up in the districts, the Civil Surgeon is responsible for the compilation of the statistics for the district as a whole and for their submission to the Director of Public Health. The province of Bombay, which belongs to this category, is an exception. Here returns from municipalities and *talukas* are submitted to the Assistant Director of Public Health of the range concerned and he sends a consolidated return for his range to the Director of Public Health. In the province of Madras the compilation of all the returns from individual villages has been centralised in the office of the Director of Public Health, the return from each village passing, through the Tahsildar of the *taluk*, to the Director of Public Health. It has been the experience that the chances of errors in compilation become greater when the number of intermediate stages of compilation is increased.

Defects in Registration

6. These are mainly:—

(1) omission to register appreciable numbers of births, deaths and cases of notifiable diseases and

(2) incorrectness of the recorded cause of death.

7. *Incompleteness of registration.*—Some idea of the extent of error, for the country as a whole, through incompleteness of registration may be obtained from a comparison of the recorded birth and death rates for British India and those derived by what is known as the "Reverse survival" method, which has been described in the chapter dealing with the population problem in Volume II of this report.

British India.

Period	Birth rate		Death rate	
	Recorded rate	Estimated rate (Reverse survival method)	Recorded rate	Estimated rate (Reverse survival method)
1891—1901	33	46	31	44
1901—1911	37	49	33	43
1911—1921	37	48	34	47
1921—1931	33	46	25	36
1931—1941	34	45	23	31

The differences between the birth and death rates based on the registered figures and those obtained by the reverse survival method are appreciable in respect of every decade.

8. One of the causes for such incompleteness of registration is that, over large areas in the country, registration of births and deaths is not compulsory. Further, as has been pointed out in the Memorandum on Indian Vital Statistics, " even in those limited areas where registration is compulsory, the provisions of the Acts are rarely enforced, so that generally speaking vital statistics are deplorably defective ". Another cause is that the village *chowkidar*, who is responsible for reporting these events in respect of the rural population, and the police, who are responsible for registration, are so over-burdened with other work that the tendency is to regard their duties in connection with vital statistics as of relatively smaller importance.

Incorrectness of the Registered Cause of Death

9. A reasonable degree of accuracy in the registered cause of death can be attained only by certification by a medical man who has had the opportunity of examining the patient before his death. The absence of an adequate health service to meet the requirements of the people and the fact that, for the rural areas as a whole, the reporting agent is the illiterate *chowkidar* together help to render the recorded causes of mortality of little value from the point of view of assessing public health conditions. No accurate estimate of the degree of error in these recorded causes of death can be given. The results of a scheme of verification of the cause of death in Delhi City carried out by the Medical Officer of Health during 1937 may, however, help to throw some light on this question. Of 9,660 deaths registered during the year, nearly 98 per cent. were enquired into by medical men and, from the history obtained, the probable causes of death were deduced. Obviously such a method is defective as compared with medical certification. Nevertheless, the " verified " cause of death is likely to give a greater measure of accuracy than the cause ordinarily registered. The following figures and the comments on them are quoted from the 1937 annual report of the Public Health Commissioner:—

	Notified and registered cause of death.	Verified cause of death.
1. Malarial fever	5	236
2. Measles	123	123
3. Smallpox	575	575
4. Typhoid fever	395	388
5. Diabetes	10	13
6. Broncho-pneumonia	6	2,252
7. Pneumonia	1,035	568
8 Phthisis	516	882
9. Puerperal fever	1	50
10. Senile debility	29	661
11. Infantile diarrhœa	123	1,117
12. Premature birth	5	194

"In some cases, the discrepancies are very large. The combined figures for pneumonias, for instance, show a difference of 1,779; infantile diarrhœa, premature births, phthisis and puerperal fever all show considerable variations, whilst for 'senile debility', the number recorded is no less than 632 in excess of the registered number. If the assumption is made that the "verified" causes of death give a greater measure of accuracy than the "notified and registered" causes, then the striking differences in numbers under such headings as pneumonia, puerperal fever, infantile diarrhœa and "premature birth" signify certain directions along which preventive measures should be taken."

In the absence of medical certification, even verification of the cause of death on the lines indicated above can be of great value from the point of view of health administration.

Errors of Compilation

10. The Memorandum on Indian Vital Statistics has referred to an investigation carried out by the Madras Public Health Department some years ago, which revealed that, in one district, the monthly statistical return "contained figures only for 25-35 per cent. of the 1,664 villages included in that district". In that province, when the compilation of all returns from individual villages was centralised in the office of the Director of Public Health, a considerable improvement was recorded. Defaulters could be watched and appropriate action taken so as to ensure that the consolidated return for the province was made as complete as possible. We have already pointed out that the general experience has been that, with an increase in the intermediate stages of compilation, the chances of error creeping in become greater. In recognition of this, the Central Advisory Board recommended that other provinces should also adopt the centralised form of compilation which has been in operation in Madras.

Notifiable Diseases

11. Our remarks in the preceding paragraphs regarding large omissions in the registration of births and deaths and errors in compilation apply also to notifiable diseases. The extent of error in regard to omission is, however, less in the case of the common epidemic diseases of cholera, smallpox and plague than in respect of other infectious diseases. This is due to the fact that the signs and symptoms of the former are generally known to the people. Although it will not be correct to claim even a reasonable approach to completeness of registration for these three diseases, the recorded figures for them give a fairly clear indication of their varying incidence from year to year. Such an assumption is not permissible in respect of other communicable diseases. Indeed, many of them can be diagnosed only if medical aid and laboratory facilities are available. Examples are tuberculosis, cerebrospinal fever, typhus, typhoid and relapsing fever. These are now notifiable in both rural and urban areas in a certain number of provinces. In the absence of the necessary facilities for proper diagnosis it seems certain that no reasonable proportion of the

actual occurrences of these diseases will be brought on record, while the correctness of the registered events under each disease is open to question. The number of communicable diseases, which are notifiable in the different provinces, varies considerably. For instance, the 1937 annual report of the Public Health Commissioner gives 22 for the Central Provinces, 20 for the Punjab and 7 for the North-West Frontier Province. The question of reducing the list of diseases notifiable in rural areas to the minimum possible and of increasing the number of such diseases in urban centres in proportion to the facilities for diagnosis which may be expected to be available will have to be considered when we put forward our proposals for the improvement of vital statistics.

12. To sum up, the main defects of the existing system of registration and compilation of vital statistics in India are:—

(1) registration is not compulsory over large parts of the country;

(2) even where registration is compulsory, failure to enforce the law against defaulters has resulted in no material improvement being effected in such areas;

(3) omission to register births, deaths and cases of notifiable diseases is appreciable in all parts of the country, a contributory factor being that the duties to be performed by village *chowkidars* and police officials in regard to vital statistics are not adequately discharged because of other important duties they have to attend to;

(4) gross inaccuracy in the registered causes of mortality in the absence of medical certification of death;

(5) large omissions in the recorded incidence of notifiable diseases and incorrectness in their diagnosis, mainly owing to the fact that many such diseases have been made notifiable in areas where no proper facilities for their diagnosis exist and

(6) errors in compilation, probably assisted by the fact that, in certain provinces, this work is carried out at a number of administrative levels.

CHAPTER XIII

PROFESSIONAL EDUCATION

1. We shall deal with professional education in the field of health under the following heads:—

(1) Medical education.

(2) Dental education.

(3) Nursing education.

(4) The training of certain types of public health personnel.

(5) Pharmaceutical education.

(6) The training of technicians.

(7) The training of hospital social workers.

MEDICAL EDUCATION

2. Under this head we shall consider the facilities available for the training of undergraduates and of medical licentiates, for postgraduate education and for refresher courses.

Undergraduate Training

3. Undergraduate training is given in colleges affiliated to universities and the preliminary educational qualifications for entrance to such colleges is an Intermediate in Science or a qualification recognised as equivalent. The preliminary qualifications required, the period of study, the subjects of study, and the examinations to be held are governed by certain general instructions issued by the All-India Medical Council, which has the power to lay down the minimum standards required.

4. *Admission to medical colleges.*—There are, in India, some 19 medical colleges which include two in Indian States (Mysore and Hyderabad) and a special college at Delhi for women students only. The other colleges are located in the provinces of Madras, Bombay, Central Provinces and Berar, Bengal, the United Provinces, the Punjab, Bihar and Orissa which is a recent addition. The total number of students admitted into these colleges each year is about 1,200. For a population of 400 millions the annual intake of 1,200 students for medical training is definitely low. In some places the authorities concerned have laid down conditions regarding the community, residential qualification, etc., of the candidates to be admitted to the colleges and selection committees have been appointed to choose the applicants after taking into consideration all these conditions.

5. *Course of study.*—The course of study extends, in the majority of medical colleges, over a period of five years. A six months' preliminary Pre-Registration course is, however, insisted upon before the commencement of the regular medical course in the Madras, Andhra and Mysore Universities, partly because the Intermediate in Science examination in these Universities does not provide a practical test and partly because it is considered that a

vocational bias in the teaching of the subjects of physics, chemistry and biology is desirable.

6. *Pre-clinical Training.*—The teaching of the basic medical sciences of Anatomy and Physiology covers generally a period of two academic years. Our criticisms regarding the existing training in these subjects are, broadly, (1) that too much detail is taught and is expected of the student, so that he gets lost in details and does not acquire a sound knowledge of the fundamental facts; (2) that the practical application of these subjects to later studies in clinical subjects is not brought home to the student; (3) that the transition from pre-clinical to clinical studies is abrupt; and (4) that the student in the period of clinical training does not have applied anatomy and applied physiology taught to him by his pre-clinical professors.

7. A deficiency, which is noticeable in practically all the medical colleges in the country, is that the teaching of the pre-clinical subjects has not been organised in an atmosphere of research, with the result that the student's powers of observation and of drawing deductions from such observation are not adequately stimulated.

8. As regards Anatomy, a disproportionately large amount of the total period devoted to the medical course appears to be spent in this country on the teaching of this subject as compared with the practice in countries in which medical education is on more progressive lines. For instance, in the King Edward Medical College, Lahore, the subject appropriates to itself 1,274 hours out of a total of 4,546 for the entire medical curriculum and, in the Andhra University, 1,124 hours out of 4,158. At Harvard, on the other hand, the corresponding periods are 480 hours out of 4,000 and in Russia 438 out of 5,760 hours. It is believed that the time taken up by lectures and demonstrations and by dissection can be curtailed to an appreciable extent, if the existing staff can be increased sufficiently to enable individual attention to be given to the students and to have the training developed, to a large extent, on the lines of tutorial classes.

9. The teaching of Physiology is mainly didactic. ' The teaching of experimental Physiology does not come up to the standard of even the average medical school in the United Kingdom. In several colleges biochemistry is taught by the Professor of Physiology, while in other countries it is given the status of a separate professorship.

10. The teaching of Pharmacology is also imparted mostly through lectures. In the country as a whole, arrangements and equipment for experimental pharmacology are of a low standard. Pharmacy claims a disproportionately small period of time in the practical classes. There is but little liaison between the departments of medicine and pharmacology in the imparting of instruction in applied pharmacology and therapeutics.

11. *Clinical training.*—A survey of existing facilities for the clinical training of medical students reveals the fact that there is

considerable room for improvement. Certain points to which we desire to draw attention are:—

(1) Too many didactic lectures are being given in the colleges with little benefit to the student.

(2) There is imperfect correlation in the teaching of Pathology, Bacteriology, Hygiene, Medicine and Surgery. As a consequence there is repetition of the same theme, possible divergence in the methods of teaching and waste of time and energy.

(3) Further, there is little or no coordination and planning in clinical instruction among the different clinical teachers of a department (medicine, surgery or obstetrics and gynaecology), so that the student, who passes from one clinical teacher to another, is not infrequently treated to a repetition of the same topics.

(4) The proper selection of cases suitable for undergraduate teaching and the availability of such cases at the proper time are not being given adequate consideration in admitting cases to the teaching hospital. Instead of a variety of cases of primary importance to the general practitioner being available, not infrequently rare and complicated cases are permitted to fill the wards, the study of which, though of doubtless interest to the specialist, is not suited to the requirements of the undergraduate.

(5) The teaching in the out-patient department is deplorably deficient in many institutions. The overcrowded, insanitary and noisy surroundings which exist cannot provide the atmosphere necessary for proper clinical teaching.

(6) The emphasis laid on the teaching of preventive medicine and public health in the medical student's undergraduate course is quite inadequate. We recognise that, in other countries also, although considerable lip service has been paid to the importance of inculcating the idea of prevention in the student throughout the medical course, very little advance has been made in the organisation of a programme of training fulfilling this purpose. In India the way in which the subject is taught is such as to encourage the student to consider it as of little importance and of less interest. Details about such matters as water supply, sewerage systems and vital statistics and their calculation make the course dull and uninteresting. As far as we are aware, in no teaching institution are the practical and applied aspects of preventive medicine placed before the student in such a manner that he can assimilate them and appreciate fully their importance both to the individual and to the community. In the teaching of the subject the student can and should be brought into contact with those environmental and social conditions which largely influence

ill-health in the individual and in the community, and it is only by doing so that the medical student will be properly equipped for his future responsibilities as a doctor and as an adviser to the people in all matters relating to health. We shall take into consideration these requirements in the proposals we put forward for the reorganisation of undergraduate medical education.

The Professor of Public Health, where such a post exists—in many colleges there is only a lectureship in this subject—is frequently a member of a Government or other public health department. It seems to us that any public health official, who is burdened with departmental duties, cannot have sufficient time to perform the functions expected of a professor. Such an officer, in our opinion, is well fitted to give lectures and demonstrations to students on certain aspects of health work but that he should be made entirely responsible for education in this important field of medicine is an arrangement which we consider unsuitable.

(7) In relation to the number of students to be catered for, the hospital facilities, the number of beds per student, more particularly in medicine and surgery, the number of clinical teachers available and the time devoted by them to teaching cannot be considered sufficient.

As regards the number of beds per student, the existing provision in certain colleges is shown below:—

	No. of beds per student.
Grant Medical College, Bombay	5
Stanley Medical College, Madras	9
King Edward Medical College, Lahore	5
King George Medical College, Lucknow	4
Carmichael Medical College, Calcutta	5

We are advised that a ratio of 10 beds to each student is what is normally required.

As regards the teaching staff, a survey of the existing medical colleges has made it clear that the number of teachers, in most of them, is inadequate for the total number of students. Not all the universities have, as yet, prescribed necessary minimum qualifications for the teaching staff but the trend has been towards insisting on certain minimum qualifications. Usually a postgraduate degree, such as the M.D. or the M.S. or a similar qualification, is insisted upon for professors and lecturers. The University of Madras has prescribed in detail the qualifications required for the teaching staff in all subjects of study. In some provinces the professorial chairs are reserved for members of the Indian Medical Service or Provincial Medical Service. In other provinces the field of selection extends to others also. The age of retirement is fixed at 55 as far as Government colleges are concerned, but in private colleges no age limit has been laid down and there has, indeed, been a tendency

to recruit retired men from Government services. In one college the majority of the senior members of the staff are persons who have passed the age of 55 and some of them are as old as 60 and 65. In an institution where a large measure of personal attention and supervision of the work of the student is necessary, it is a disadvantage to have a number of professors who are advanced in age. Another factor making for inefficiency, which has been noted, is that the members of the staff are not often full-time teachers. Many of them are busy practitioners working in an honorary capacity. Others, though members of the public service, are permitted to take private practice and they therefore devote a considerable part of their time to it. In certain institutions part-time teachers are employed even in pre-clinical subjects and the right of private practice has been given to them too. It seems almost certain that such members of the teaching staff are not in a position to devote adequate time and attention to their teaching duties.

Certain Other Matters

12. *Laboratory facilities and equipment.*—Owing to the conditions brought about by the War, there has been a certain amount of difficulty for the different medical colleges to secure adequate stocks of equipment and laboratories have had to be run with a shortage of various chemicals and appliances. In some colleges, however, the equipment and laboratory facilities available to the students may be said to be adequate for the numbers under training. In others the existing accommodation and facilities require improvement.

13. *Museum.*—Museums are available in all the colleges, but there is room for enlarging their scope and improving their usefulness. Only a few museums are provided with curators.

14. *Library.*—In many colleges the library facilities available are not adequate either for the students or for the staff and the annual allotment for this purpose is far from sufficient in many institutions. No clear-cut distinction has been made between the library facilities available for the students and those for the staff. The number of periodicals provided for the members of the teaching staff is small and insufficient in certain colleges. We believe that a large outlay will be required in all institutions on the development of libraries, in order to enable the teachers to keep abreast of advancing knowledge and to provide facilities for research. None of the medical colleges at present possesses a trained librarian, with suitable assistants who are capable of preparing a proper index and of translating articles from foreign periodicals.

15. *Social amenities.*—Most medical colleges have facilities for recreation for their students and many of them provide hostel accommodation for a proportion of them. The provision of common rooms, dining halls and other facilities is not, however, adequate in all the colleges.

16. *Residential accommodation in hospitals.*—No proper accommodation for medical students who are expected to be in residence or to take duty in turn is available in the teaching hospitals.

The Technical Control of Undergraduate Medical Education

17. As has already been pointed out, the Indian Medical Council has the right to inspect medical colleges and to suggest methods of improving the efficiency of the training given. Such inspections have been carried out within the last ten years after the inauguration of the Indian Medical Council and has led to the rectification, in a number of medical colleges, of defects that existed.

18. As these colleges are affiliated to universities, the latter can also exercise control by laying down conditions to satisfy the following requirements:—

(i) The qualifications of the teaching staff and the number required in each subject.

(ii) The accommodation required in the laboratories and the number of students that should be admitted.

(iii) The hospital facilities available and the number of beds that should be at the disposal of each student for adequate clinical study.

(iv) The amenities that should be available to the students in the shape of common rooms, reading rooms, playing fields, hostels, etc.

(v) In general, the arrangements required in the college and associated hospitals in order to ensure that efficient instruction is being given to the students.

Some universities have been more strict in the control of the medical colleges under their charge than others. On the whole, we consider that there is need for more efficient supervision and control of academic standards in these colleges by the universities concerned. A university has the power to send periodically an inspection commission to report on the working of the colleges under its control and at least the Universities of Bombay and Madras have in the past sent such commissions.

Licentiate Education

19. The majority of the medical schools are run by the State. The total is 19 of which 12 are maintained by Governments, one by the Mysore State, two by Missions and four are privately managed. The majority of these schools are in Bengal and Bombay; 9 out of 19 in Bengal and 4 in Bombay. The total number of students admitted varies from year to year but may be taken to be in the neighbourhood of 1,000. The finances of these schools are, speaking generally, most unsatisfactory, resulting in grave deficiencies in equipment, libraries, museums and laboratories. The majority of these schools cannot be considered satisfactory either from the standpoint of the clinical facilities available in the attached hospitals or from that of the number of teachers provided. The visits we paid to a number of medical schools in different

parts of the country have made it clear that little or no improvement has been made in them in regard to the position described about six years previously by the Director General, Indian Medical Service, in his Indian Medical Review published in 1938. A statement showing details regarding the number of students admitted, equipment and staff in the medical schools in Bengal in 1944 is given below :—

Statement showing the number of students admitted, equipment and staff in the medical schools of Bengal.

—	Total students	No. admitted yearly	Average cost	No. of microscopes	No. of teachers	No. of beds in hospitals	No. of midwifery cases yearly
			Rs.				
1. Campbell Medical School, Calcutta.	727	168	600	13 phy. 31 Path.	14 plus 12 . . Demons.	717	685—1938-39 958—1939-40 1,265—1940-41
2. Dacca Medical School.	453	100	414	40 phy. 18 Path.	10 teachers 15 Demons. (All L.M.P. or L.M.F.) No teacher in Paths. 9 months.	261	105—1938-39 139—1939-40 108—1940-41
3. Lytton Medical School, Mymensingh.	220	53	203	14 Phy. 14 Path.	9 teachers (3 part time) 5 Demons.	140	110—1938-39 210—1939-40 230—1940-41
4. Ronaldshay Medical School, Burdwan.	220	50	175	16 Phy. 17 Path.	11 teachers. (4 part time) 5 Demons.	155	112—1938-39 134—1939-40 179—1940-41
5. Chittagong Medical School, Chittagong.	186	50	170	14 Phy. 11 Path.	10 teachers (7 part time) 3 Demons.	124	173—1938-39 231—1939-40 252—1940-41
6. Jackson Medical School, Jalpaiguri.	132	40	262	18 Phy. 10 Path.	10 teachers (4 part time and 3 Hony.) 6 Demons.	110	261—1939-40 337—1940-41
7. Calcutta Medical School, Calcutta.	416	100	150	..	26 teachers (All part time and 1 Honarary).	168	
8. Sammilani Medical School, Bankura.	247	68	276-9-3	12 Phy. 5 Path.	15 teachers 5 Demons.	106	81—1938-39 101—1939-40 129—1940-41
9. National Medical School, Calcutta.	380	100	843	18 Phy. 19 Path.	22 teachers 24 Demons. (All except one either part time or Honorary).	322	380—1939-40 382—1940-41

20. The absence of a central body to control medical school education has naturally led to a wide divergence of standards in the training given in the different schools and, of late, owing to the growing demand for doctors an increasing number of students has been admitted every year to the already congested, ill-equipped and understaffed schools. Without going into the defects of individual institutions it may be stated that the majority of them provide education far below reasonable standards.

21. In 1938 a conference was held in New Delhi under the auspices of the Government of India. The whole question of school medical education was reviewed and the recommendation was made that medical schools should be converted into colleges. In 1942 the Indian Medical Council passed a resolution that all medical schools should be abolished by 1947, its finding being based partly on the recommendation of the conference mentioned above and partly on the repeated appeals made to it by licentiate medical associations. Since the 1938 conference eight of the then existing schools have either been abolished or converted into colleges, but progress in this direction is slow and, in the absence of provision of adequate funds, is likely to continue to be slow.

Postgraduate Education

22. The existing facilities for postgraduate education in the different medical colleges are few. Recently there has been a great deal of activity shown by most universities in the institution of postgraduate degrees and postgraduate diplomas without, however, providing in every case the necessary facilities for adequate instruction in the subjects concerned. Madras is, in this connection, an exception. There are two university diplomas, one in Obstetrics and Gynaecology and the other in Ophthalmology, and the training, which is in both cases for a period of one academic year, is imparted in the special hospitals concerned. Government diplomas also exist in the specialities of Tuberculosis, Radiology and Clinical Laboratory Sciences with adequate provision for the training of students in these subjects. Courses for Diplomas in Public Health and in Maternity and Child Welfare are given at the All-India Institute of Hygiene and Public Health, Calcutta, as well as shorter courses in certain branches of public health work. For the Diploma in Public Health the Institute is affiliated to the Calcutta University. The Universities of Bombay and Madras also award a similar diploma, the one granted in Madras being known as the Bachelor of Sanitary Science (B.S.Sc.). Facilities for the required training are available at the Grant Medical College, Bombay, and at the Madras Medical College. In addition, the University of Calcutta grants a Doctorate of Science in Public Health (D.Sc.) and the University of Bombay a Doctorate in Hygiene (D.Hy.). Regular postgraduate courses are also provided in the School of Tropical Medicine at Calcutta.

23. In certain universities the degrees of M.D. and M.S. provide for specialisation in such subjects as Ophthalmology, Bacteriology, Anatomy and Physiology. Research degrees have also been

instituted in some universities in the non-clinical subjects of Anatomy, Physiology, Pharmacology, Biochemistry, Pathology and Bacteriology. The diplomas, that have been instituted in the different universities, include the following subjects:—

Ophthalmology.	Orthopaedics.
Psychological Medicine.	Obstetrics and Gynaecology.
Radiology.	Dermatology.
Pediatrics.	Tuberculosis.
Oto-Rhino-Laryngology.	Anaesthesia.
Venereology.	

As has already been pointed out, in many cases proper instruction courses in these subjects have not been organised at the different centres where such special degrees or diplomas have been instituted by the universities concerned. When such training facilities become available, there should be wide scope in the country for specialisation on satisfactory lines.

24. No organisation to coordinate and foster postgraduate education exists in any of the universities, except Madras where a Council of Postgraduate Medical Education has recently been formed. It is understood that a proposal for the institution of a similar organisation is under consideration in the universities of Bombay and Calcutta.

The Training of Teachers

25. No special facilities are now available in the universities for the training of teachers in the different subjects of the medical curriculum. At the same time, it is not correct to say that there are no opportunities for young men desirous of becoming teachers to work in the different departments of individual colleges and to acquire knowledge and technical skill. In some medical colleges, however, such facilities are available on a larger scale than in others. The specialities in which such training can be undertaken also vary from college to college. On the whole, however, provision for the training of teachers must be considered to be quite inadequate.

Refresher Courses

26. As far as we are aware no organised efforts have been made either by universities or by Governments to start refresher courses for general practitioners. It is understood that sporadic attempts were made in some provinces in this direction before the war, but these have not, it is understood, led to the development of such facilities on a satisfactory basis.

DENTAL EDUCATION

27. Dentistry has unfortunately been one of the neglected subjects of study in practically all Indian Universities. There are at present four dental colleges: (1) the deMontmorency College of Dentistry, Lahore, (2) the Calcutta Dental College and Hospital, (3) the Nair Hospital Dental College, Bombay, and (4) the

Currimbhoy Ebrahim Dental College, Bombay. The first and the last are supported by the Governments of the Punjab and Bombay respectively, while the other two are under private management. The college at Lahore is the only one which is affiliated to a university.

28. The Calcutta Dental College and Hospital was established in 1920 and the Nair Hospital Dental College in Bombay in 1932. These two institutions were developed in the face of great difficulties and with inadequate financial support. They suffer, to some extent, from insufficiency of accommodation, of suitable equipment, staff and teaching facilities, particularly with regard to the clinical teaching material available in the hospitals concerned. The Calcutta Dental College and Hospital is affiliated to the State Medical Faculty of Bengal in accordance with the provisions of the Bengal Dental Act of 1939. The course is one of four years for new entrants and of two years for qualified medical practitioners. The Nair Dental College, Bombay, also offers a four years course, the examination being conducted by examiners appointed by the Bombay Government. The minimum educational qualification required for admission to both these Colleges is the Matriculation Examination of an Indian University. Each of these colleges takes in about 30 students and, during normal times, an average number of twenty students passes out from them every year.

29. The deMontmorency College of Dentistry, is, as has already been pointed out, affiliated to the Punjab University and the instruction given leads to a university degree in dentistry, the B.D.S. (Bachelor in Dental Surgery). This affiliation was granted in 1938. A separate Faculty of Dentistry was created in the same year. The preliminary educational qualification required for admission is the Intermediate in Science of an Indian University or a qualification recognised as equivalent to it. The course extends over a period of four years and an examination is held at the end of each year of study. The medical subjects of the curriculum are taught at the King Edward Medical College, Lahore, while the courses in dentistry subjects are given by four professors, who have direct charge of the several departments of the hospital. The paid staff of the College includes a Principal, who is also the Superintendent of the Hospital, three other full-time professors, four demonstrators and one part-time assistant dental surgeon. The number of annual admissions is about 20.

30. The average number of students trained each year at the Currimbhoy Ebrahim Dental College, Bombay, is not known, although it is understood that the number is less than that trained in the Nair Dental College. It will thus be seen that the total number of qualified dental surgeons produced in the country annually is small, probably not more than 60 or 70.

31. Facilities for postgraduate training in dentistry hardly exist in this country. The number of qualified dentists in India is not definitely known but is not likely to exceed 1,000. The number of persons with advanced training in foreign countries is strictly

limited. An essential step for the development of undergraduate and postgraduate training centres in dentistry in India is the provision of trained teachers. Facilities should therefore be provided for a selected number of dental surgeons from this country to undergo advanced training abroad.

NURSING EDUCATION

32. *Preliminary educational qualifications and the training course for nurses.*—In some provinces there are two grades of nursing qualification—the senior certificate of nursing and a junior certificate of nursing. For the senior certificate of nursing, the Junior Cambridge or a completed Secondary School Leaving Certificate or eligibility for University courses of study is generally demanded. For the junior certificate, the VI or VII standard and, in some cases, the III standard vernacular is accepted as sufficient. Nurses are being trained in English as well as in all the principal Indian languages. The period of training is not uniform and ranges from three to four years. The curriculum differs in the provinces, but in most cases, the four years course includes also training in Gynaecological Nursing and in Obstetrics and in some provinces, it is compulsory for every nurse to have a combined sick-nursing and midwifery training. The examinations are conducted by special examination boards appointed either by the Government or by the Provincial Nursing Council concerned. Male nurses are also trained in some provinces and the trend is towards opening the profession to all, irrespective of sex.

Training Schools

33. The training schools for nurses are not of a uniform standard. Many of them do not come up even to the minimum standards usually required for such training. In the majority of these schools the services of the nursing student are used to supplement the work of the nursing staff of the hospital concerned and she is treated rather as an employee of the hospital than as a student who ought to be given proper training. There are only a few hospitals which place the interests of the pupil nurse above that of the hospital and give her the kind of treatment which a medical student, for instance, gets in a medical college and its affiliated hospitals. Another serious defect is that the accommodation provided for these pupils is extremely unsatisfactory. Deplorable living conditions, with gross over-crowding, is the rule rather than the exception. The fact that these hospitals are generally very much understaffed and that the pupil nurses are required to participate in the routine duties of the hospital results in their being given little or no opportunities for recreational and cultural activities.

34. The pay, status and general service conditions of the nurses require considerable improvement if the proper type of women is to be attracted to this service in adequate numbers. This subject has been discussed in the chapter dealing with existing provision for medical relief and preventive health services in the provinces.

Postgraduate Training for Nurses

35. The trained nurse in India has very few facilities for post-graduate training. Recently the Bombay Nursing Council started an advanced course in midwifery and pediatrics nursing, which provides training facilities for nurses specially interested in either of these subjects. In Madras a short six months' course for post-graduate study for nurses has recently been instituted. The Government of India opened in 1943 in Delhi a School of Nursing Administration, which provides a course for nurses to qualify as certificated sister tutors, and a course of study in hospital nursing administration. This latter course has had to be devoted, so far, almost entirely to the requirements of the Army and consequently the curriculum was modified accordingly.

THE TRAINING OF CERTAIN TYPES OF PUBLIC HEALTH PERSONNEL

36. Existing facilities for public health training for under-graduate medical students and postgraduate training for doctors have already been discussed in the section dealing with medical education. We shall here confine ourselves to the training of health visitors, midwives, *dais*, sanitary inspectors, vaccinators and public health engineers.

The Training of Health Visitors

37. There are training schools for health visitors at Lahore, Delhi, Lucknow, Calcutta, Madras, Poona, Bombay and Nagpur. The preliminary educational qualifications required for admission to these schools, the periods of training, the syllabuses followed and the languages in which instruction is given, vary considerably. The general education required is as low as the third class of the Anglo-vernacular school in Poona and as high as the Matriculation or its equivalent in Madras and Delhi. The authorities of certain schools insist that the preliminary educational qualifications should include a midwifery diploma and preference is given to candidates who possess, in addition, the certificate for general nursing also. Other training schools do not require even the midwifery certificate for admission. The period of training extends from nine to eighteen months. The medium of instruction is, in some schools, English and in others the local Indian language. The final examination is held by the Provincial Nursing Council or by authorities appointed by the Provincial Government.

38. The course of training includes work in a maternity and child welfare centre maintained either by the local health department or by a voluntary agency. Field training in rural and urban health centres is also included in the course.

39. The best type of health visitor available in the country is normally a qualified midwife with some elementary training in general hygiene and preventive health work. Her main duties are to supervise the domiciliary work of midwives and of trained *dais*, where the latter are employed, and to participate in preventive

work associated with the hygiene of pregnancy and of the postnatal period. On the other hand the tendency in the countries, where health administration is more advanced than in India, is to create and employ a type of woman worker known as the public health nurse, who, under the guidance of the doctor, is able to take part in the extension of preventive health work in all fields of activity to the homes of the people. The training of such a worker includes the course for sick-nursing and for midwifery, with special emphasis laid, throughout the period of instruction, on the preventive and community aspects of health administration. In developing a health programme on modern lines India will also require the services of this general type of preventive worker and the question of introducing suitable modifications into the existing training courses for health visitors will require consideration.

The Training of Midwives

40. The period of training for midwives varies in the different provinces. In the case of fully certificated nurses the midwifery training included in the course extends over a period which varies from six months to one year. In the case of those who are trained only as midwives the course varies from one to two years. The inclusion of domiciliary practice in the training is by no means general. In a certain number of the training institutions in the North-West Frontier Province, Madras, the Central Provinces and Assam provision for domiciliary training exists. There is no such provision in the training centres in the Punjab, Delhi, Bombay and Sind. The examination for midwives is conducted by a Board appointed by the Government or by the Provincial Nurses and Midwives Council concerned.

41. As in the case of pupil nurses, the training centres for midwives make use of pupils to make up the shortage in the personnel of the hospitals concerned. A number of training centres are defective in that the facilities for giving antenatal instruction are insufficient as well as the amount of clinical material available to enable the pupils to obtain a thorough appreciation of the normal and abnormal conditions pertaining to labour. Taking into consideration the number of beds, the total number of doctors and other requirements for the satisfactory training of pupil-midwives, the number of those admitted into certain institutions is far in excess of that which can be properly trained. Our remarks regarding accommodation and other amenities in respect of training institutions for pupil nurses apply equally to the training institutions for midwives. In fact, in many cases the conditions are worse.

42. Although there are approximately 11,000 certified midwives and 700 assistant midwives on the registers maintained by the Provincial Nursing and Midwives Councils, the actual number of practising midwives is much less, probably about 5,000 in the whole country. Some of the causes for this discrepancy are that many nurses, who are qualified as midwives and yet do not practice this profession, are included in the lists, that some are registered

in more than one province and that, as the registers have not been kept up to date, the names of those who have died, have given up practice or left the country, have not been deleted. For the provision of adequate midwifery aid to all women undergoing childbirth in British India about 100,000 midwives will be required on the basis of one midwife for 100 births. If the estimated number of 5,000 practising midwives in the country is even approximately correct, it will be seen that the existing training facilities for this class of health worker will have to be developed on an enormous scale, in order to meet the requirements of the country.

The Training of

43. The training of indigenous *dais*, *i.e.*, of persons whose hereditary profession is the practice of midwifery, has been attempted in certain provinces. It is not easy to wean the *dai* from her normal objectionable methods and many, who have been associated with the training of this class of person in modern midwifery, have naturally expressed doubts of the possibility of converting the *dai* into a useful worker. We would, however, point out that the past efforts in this direction have largely failed because of the lack of adequate provision for the supervision of the work of trained *dais* as well as for periodical refresher courses. If such provision is made we believe that it should be possible to make the *dai* a fairly satisfactory accoucheuse. The difference between the existing number of midwives and that required by the country to provide adequate service is enormous. Any conceivable extension of training facilities cannot, we feel, help to make up this difference within a reasonable period of time. In the meantime it seems to us essential that, during this interim period, every effort should be made to make available a service which, although it may not be of the high standard that modern health administration demands, will yet be an improvement on what the vast majority of the women of India are now able to obtain. In attempting to do so, we feel that the possibility of utilising the services of the hereditary class, which has been rendering midwifery aid to the people for centuries, with such safeguards as may be necessary, cannot be ignored.

The Training of Public Health or Sanitary Inspectors

44. In Delhi Province, the Central Provinces, the North-West Frontier Province and Assam no facilities exist for the training of sanitary inspectors. In Bihar and Bengal the course has been held in abeyance. In Orissa and the United Provinces the course is said to be held only as and when the need for it is felt. The only provinces where the course is held regularly are Madras, Bombay, the Punjab and Sind. These four together provide training facilities for about 300 sanitary inspectors each year, while the number of those who qualify is approximately 200. If the schools in Bihar, Orissa, and the United Provinces again begin to train sanitary inspectors, about 100-150 more candidates can be admitted for training and about 70-100 more qualified men may become available annually.

45. The period of training varies from six weeks in Bihar to one year in Madras and Orissa. The basic qualification necessary for a candidate before he is admitted for training is not uniform throughout the country. While in Madras the secondary school leaving certificate or the matriculation is required (it is understood that often candidates who have passed the Intermediate Examination of the University apply for the course) the initial qualification required in certain other provinces is much lower. The syllabus followed is also not uniform. The existing syllabuses lay greater emphasis on the theoretical rather than on the practical aspect of training. Further, greater consideration is given to urban than to rural health problems. India requires in large numbers a type of sanitary inspector who can participate effectively in the practical application of modern hygiene to rural health conditions, and adequate consideration will have to be given to this requirement in evolving a satisfactory course of training for this class of health worker.

The Training of Vaccinators

46. The basic educational qualification required for the vaccinator's training varies in the different provinces but it is usually the middle English or the middle vernacular standard. The duration of the training ranges from three months to ten months. In most provinces this training includes instruction in elementary hygiene so as to fit the vaccinator for assisting in public health work. Practical training in the field is given by a senior vaccinator under the supervision of a medical officer of health or by the latter himself. In most of the provinces additional training is also given at the local vaccine institute, where vaccine lymph is manufactured.

47. It is understood that, a short while ago, a special investigation was carried out by an officer deputed by the Public Health Commissioner with the Government of India into the various aspects of vaccination against smallpox, including the preparation and distribution of vaccine lymph, the conduct of vaccination and the training of vaccinators. It is hoped that the standards of training for vaccinators in the different provinces will be raised and made uniform, as the result of the action taken on the recommendations of this officer.

The Training of Public Health Engineers

48. Existing engineering colleges in India have not yet differentiated sanitary or public health engineering as a special subject. Some instruction in this subject is given, mainly in hydraulics, to civil engineering students but this part of the course occupies only a minor place in the curriculum. A Diploma in Sanitary Engineering and Plumbing is awarded by the Victoria Jubilee Technical Institute, Bombay.

> "The course is open to those who have passed the Intermediate in Science Examination of an Indian University or a higher examination, or who pass the entrance examination conducted by the Institute, which is equivalent to the Bombay

Matriculation. The course extends over a period of four years including a six months practical course. The Diploma is awarded on the results of an examination conducted by the Board of the Institute."

As far as we are aware this is the only institution in which a systematic course in the subject is available at present.

49. Civil engineers in India generally lack a biological background and are not adequately equipped to apply the principles of public health to the improvement of environmental conditions. There are separate Public Health Engineering Departments in the Punjab, the United Provinces, Bengal and Bombay, each with a small staff, and there is a Sanitary Engineering Branch of the Public Works Department in Madras. With a few exceptions, the engineers in these Departments have had no special training in Public Health Engineering. We should explain that India is by no means unique in this. The idea of public health engineering is relatively modern and has mainly been developed in America. We have indicated, in more than one place in this report, the unfortunate consequences of carrying out public works on a large scale without due regard to the public health aspects of such undertakings. The institution of special training facilities in Public Health Engineering for qualified engineers as well as the inclusion of more detailed instruction in this subject in the curricula for civil engineering students in the different colleges must, in our view, receive serious consideration.

PHARMACEUTICAL EDUCATION

50. Existing facilities for pharmaceutical education in India are quite insufficient. Three types of training are available: (1) the compounder or dresser qualification, (2) the chemists and druggists qualification and (3) a college education leading up to a degree in pharmacy.

The Compounder or Dresser

51. The period of training for a compounder's qualification varies from one to two years and the preliminary qualifications demanded in the different provinces are not uniform. In some, candidates who have completed the middle school examination are admitted, while in others the completion of a high school education is required. The candidates are usually trained first in district headquarters hospitals and are then given an intensive short course in some central hospital. In Bengal, since 1928 the training period for compounders has been increased to two years, of which the first year has to be spent in some specified institution, where the candidate receives instruction in materia medica, the laws regulating the sale of poisons and practical pharmacy. This is followed by an examination after which the second year is spent in apprenticeship in a chemist's or druggist's establishment or at a hospital. In Madras candidates are required to have the basic qualification of a Secondary School Leaving Certificate. They are given practical training for nine months in certain selected district headquarters

hospitals and later an intensive course lasting three months at the Madras General Hospital. They are also given training in first aid.

52. *Chemists and druggists.*—The preliminary educational qualification for entry to the course is a School Leaving Certificate and the period of training lasts for two and a half years. This includes apprenticeship with a recognised firm of pharmaceutical chemists during the last year of study. The subjects included in the curriculum are chemistry, both organic and inorganic, botany, pharmaceutical chemistry, materia medica and pharmacy.

53. *Collegiate education.*—This is designed to turn out a class comparable to the graduate pharmacists or pharmaceutical chemists found in Europe and America. The Benares Hindu University was the first to inaugurate a course of this kind in 1934 and, since that time, other universities have also provided similar training facilities. The Andhra University instituted the study of 'Pharmaceutics' as a special subject in the curriculum for the B.Sc. (Honours) and M.Sc. Degree in Chemical Technology. The Calcutta University has a course in Pharmaceutical Chemistry for M.Sc. students. The Bombay University has opened a new course in Pharmaceuticals in their Technological Faculty. The Madras University has inaugurated a two years course, B.Sc. (Phar.), for which students who have passed the Intermediate examination in Science are eligible. Thus graduate instruction in pharmacy is of two types, one which deals mainly with the technical side of it and the other which stresses the pharmaceutical side.

THE TRAINING OF TECHNICIANS

54. We include here that class of persons who work as laboratory attendants and as radiological assistants. There are very few institutions in the country which train technicians of the above types, who are needed in large numbers as auxiliaries to the medical services. The usual method of training laboratory technicians is for an institution to take on, as an attendant, a person who need have no preliminary educational qualification. He is expected to get his training by taking part in the day to day working of the laboratory.

55. Within recent years facilities for the training of laboratory technicians have been organised in a few Mission institutions, particularly at Vellore, Madanapalli and Allahabad, under the auspices of the Christian Medical Association of India, Burma and Ceylon. A register of trained laboratory technicians has been opened. The rules for such training include a minimum educational qualification corresponding to the matriculation or its equivalent and a course of study lasting not less than nine months. The candidates are given a fairly complete practical training for the types of work connected with pathological, bacteriological and biochemical laboratories. The rules require that the training should be given in a hospital with a well-equipped laboratory and

with a minimum of 2,000 in-patients per year and a daily average of 100 in-patients. The number of students allotted to each member of the teaching and demonstrating staff is limited to two.

56. In Madras a training course for radiographers is given at the Government Radiological Institute. The course qualifies for the diploma of Certified Radiological Assistant (C. R. A., Madras), which is open to those who have passed the Secondary School Leaving Certificate Examination with science subjects or the Matriculation or its equivalent. The period of training lasts one year and consists of three parts. Part I comprises instruction in elementary anatomy, physiology and pathology. This is followed by Part II, which includes radiography, radium and X-ray treatment and electrology. Part III of the course lasts three months and is devoted to practical training. An examination is held at the end of each of the three parts.

57. No training facilities exist at present in this country for a number of types of technicians, including physical therapists, dietitians, occupational therapists and dental hygienists. There is also no provision for the training of technicians for public health work.

THE TRAINING OF HOSPITAL SOCIAL WORKERS

58. The Sir Dorabji Tata School of Social Service in Bombay is, we believe, the only institution in India which provides facilities for the training of social workers. This school has, on the whole, followed the American model and in a two-year course it provides instruction for social workers in the fields of family and child welfare, adult delinquency and industrial and labour problems. There is also a course, which includes medical and psychiatric social work and instruction on social case work and family case work. If the authorities who run this School are able to add instruction in certain special diseases such as tuberculosis, venereal diseases, etc., courses will become available here for the training of social workers in a wide range of health activity.

59. There are no facilities, anywhere in the country, for the training of hospital social workers. We feel that adequate provision for this constitutes an urgent necessity. We have little doubt that the general efficiency of all the larger hospitals in India will be greatly increased by appointing trained hospital social workers on their staff, as has been the experience recently in Great Britain and in America. They are also required if the training of the medical student in preventive medicine and public health is to be organised on sound lines.

CHAPTER XIV

MEDICAL RESEARCH

BRIEF HISTORY OF THE DEVELOPMENT OF MEDICAL RESEARCH IN INDIA

1. The present organization of medical research in India is the result of progressive development over the last 40 years. Prior to the beginning of the present century no regular organization existed and such research work as was done was carried out by medical officers on their own initiative and with their own resources, or, occasionally, by individual officers deputed by Government to investigate special problems. The studies of some of these earlier workers are classical and amongst them may be cited the work of Lewis on trypanosomes; of Carter on the spirillum of relapsing fever, leprosy, and mycetoma infections; of Macnamara and Cunningham on cholera; and of Fayrer on snakes and snake venoms. At a later date, Ross made his epoch-making discovery while employed in routine military duty.

2. The first bacteriological laboratory in India was founded at Agra in 1892 when Hankin was appointed as Chemical Examiner and Bacteriologist, and, with his training under Pasteur and Koch, he was able to stimulate interest in the subject in India. It was later proposed that a laboratory for the whole of India should be established under Hankin's direction but the scheme did not materialize. About this time the discovery of the ætiological agents of plague and cholera, the work of Manson, Ross and others on the insect transmission of disease and the working out of the life-cycles of many human parasites were opening up a promising field for medical research. Such work, with its possibilities of great and original discoveries, naturally attracted enthusiastic medical workers but few facilities for research existed and there was little opportunity for training. The first appearance of plague in Bombay in 1896 and its subsequent spread over vast areas in India, at a time when little was known of its epidemiology or of the preventive measures which should be applied, emphasized the necessity for an organization for research on such subjects. Immediate work had to be undertaken on plague and for this purpose Haffkine, who was then studying prophylactic inoculation against cholera in Bengal, was deputed to Bombay.

3. In 1899, the Sanitary Commissioner with the Government of India (Surgeon-General Harvey) submitted definite proposals for the organization of research laboratories. His scheme provided for a Central Research Laboratory and for a local laboratory in each Province and Military Command, but there was considerable delay in implementing this scheme although it was approved by the Provincial Governments, and, generally, by the Secretary of State.

4. In the meantime Haffkine's successful manufacture of plague vaccine necessitated the provision of accommodation on a large scale and for this purpose the Old Government House, Parel, Bombay, was taken over as a laboratory.

Although a number of workers had suggested the possibility of the ratflea as a vector of plague, conclusive proof had not been obtained. This problem was worked out in detail by a Commission appointed to work under an Advisory Committee the members of which were nominated by the Secretary of State for India, the Royal Society and the Lister Institute of Preventive Medicine, London.

5. A project had been under consideration for a number of years to establish a Pasteur Institute in India, and Kasauli was selected for the purpose. The Institute was opened in 1900. When the scheme for the establishment of a central institute for medical research was finally approved, Semple, who was then Director of the Pasteur Institute, was selected as Director, and in view of his experience, his view that Kasauli should be selected for the purpose prevailed and the Central Research Institute was opened there in 1906.

6. Prior to this the King Institute of Preventive Medicine had been opened at Guindy, Madras, in 1903-04 with functions largely of a public health nature, including the manufacture of calf-lymph, but also with provision for general bacteriological work and research on bacteriological and other problems related to tropical medicine.

7. Thus, at the time the Central Research Institute was opened, two of the Provinces had large Institutes available for both routine laboratory work and research, viz., the Bombay Bacteriological Laboratory, Bombay (later called the Haffkine Institute) and the King Institute, Madras. In addition, the Pasteur Institute of India, Kasauli, also served as a Provincial Laboratory for the Punjab and as a research centre.

8. In order to staff these various institutes a permanent cadre of specially selected and trained medical officers was established. This cadre was originally known as the Bacteriological Department and is still in existence as the Medical Research Department of the Government of India.

9. The following Institutes and laboratories were subsequently founded and opened in the years stated:—

Madras.—The Pasteur Institute of Southern India, Coonoor	1907
Burma.—The Pasteur Institute of Burma, Rangoon	1915
Assam.—The Pasteur & Medical Research Institute, Shillong	1917
Bengal.—The School of Tropical Medicine, Calcutta	1922
All-India.—The All-India Institute of Hygiene and Public Health, Calcutta . . .	1932
All-India.—The Malaria Institute of India, Delhi .	1939

10. The two institutes in Bengal, although primarily designed for teaching purposes, have carried out research on a large scale and many special research inquiries have been located in them.

11. The demand for routine laboratory services and for manufacture of vaccines and sera developed rapidly and it soon became apparent that the officers put in charge of laboratories were becoming increasingly involved in administrative work and routine manufacture at the expense of their true research work; they had become to a large extent immobile and were no longer available for field investigations, to which it had been intended they should devote a large part of their time and energies.

12. In 1914, to deal with this position, the Government of India created 15 additional posts to bring the cadre of the Bacteriological Department up to 30. It was intended that the additional officers should be available for whole-time research either in the field or at existing laboratories. With the outbreak of war in 1914 the scheme could not be brought into effect. Instead of extra officers being recruited and research activities extended, many officers on the small existing cadre were reverted to military duty and research work was greatly reduced.

13. A step forward in the development of medical research in India was the creation of the Indian Research Fund Association in 1911. The Governing Body of this Association appoints a Scientific Advisory Board to advise on technical matters and allocation of funds. The Association approves an annual programme of research, sanctions grants-in-aid for research, and, in certain cases, may constitute special inquiries. An annual conference on medical research is normally held at which work of the past year is reviewed, and proposals for the coming year put forward.

14. In the past, applications for grants-in-aid for specific inquiries have been made chiefly by workers in the Central and Provincial Government Laboratories, and remarkably few have been received from the Medical Colleges and Schools of India.

15. In addition to temporary inquiries, the Association has set up and maintained certain semi-permanent organizations.

(1) *The Nutrition Research Laboratories* developed out of the Beri-Beri Inquiry and Deficiency Diseases Inquiry under McCarrison at Coonoor. A semi-permanent unit with a staff of chemists, biochemists and medical assistants was constituted at Coonoor in 1925.

(2) *The Malaria Survey of India* was constituted in 1926, and took over the functions of the Central Malaria Bureau of the Central Research Institute, Kasauli. Most of the activities formerly carried out at Kasauli are now performed in the Laboratory at Delhi. In 1940, the Survey became a charge on the Government of India and only the purely research costs were borne by the Fund. At the same time, the name of the unit was changed to the "*Malaria Institute of India*".

16. In 1935, a scheme was brought into operation for forming a junior cadre of medical research workers to give younger workers of a suitable type an opportunity of taking up research. Six appointments to this cadre were made by a Selection Board, but, beyond that, the scheme has not developed. The cadre has proved

useful, and some appointments have been made from it to the Medical Research Department.

17. In 1940, a further scheme for training recruits was adopted. This consisted in the offer of Fellowships to young graduates to enable them to obtain experience in research, but not necessarily with the promise of permanent whole-time research work or of employment under the Association. A few Fellowships have been awarded and the scheme is still under trial.

18. The Indian Research Fund Association publishes the *Indian Journal of Medical Research, Indian Medical Research Memoirs* and *Journal of the Malaria Institute of India,* and maintains a library at Kasauli.

19. With the outbreak of war in 1939, many of the younger workers in the Medical Research Department were recalled for military service, or joined the Army Medical Services. The result was that research activities in Central and Provincial Government laboratories and in certain inquiries under the Indian Research Fund Association were considerably curtailed. Our investigations were, therefore, undertaken at a time when medical research activities were below pre-war standard.

SURVEY OF MEDICAL RESEARCH ACTIVITIES IN INDIA TO-DAY

I. Organization of Medical Research

20. Organized medical research at the present time depends mainly on two organizations:—

(1) The Central and Provincial Government laboratories and the Medical Research Department, and

(2) The Indian Research Fund Association.

1. *The Central and Provincial Government Laboratories and Medical Research Department*

21. When the Central and Provincial Government laboratories were established it was found necessary to maintain a permanent cadre of specially selected and trained officers to staff them. At the present time there are 80 sanctioned appointments in the Medical Research Department (originally the Bacteriological Department) maintained by the Government of India. Half of these appointments are reserved for I.M.S. officers and the remainder are open to I.M.S. and non-I.M.S. medical officers. The intention has been that the Directors and Assistant Directors of the various Government laboratories should be drawn from this permanent cadre, and, until comparatively recent years, this has been done. More recently, however, the extended activities of the Provincial laboratories have necessitated the employment of workers for special duties and these have been appointed, as required, without drawing upon the Medical Research Department. Officers of the latter Department have been placed on foreign service, from time to time, with other organizations such as the Indian Research

Fund Association and the Pasteur Institute Associations. Since the outbreak of war some of the regular officers of the Medical Research Department have been recalled to military duty and at the present time only twelve officers of this Department are employed in Central, Provincial, or other civil institutions in India, of whom six are I.M.S. and six non-I.M.S.

2. *The Indian Research Fund Association*

22. The Indian Research Fund Association is a registered association, recognized by, and in close touch with, the Government of India, from whom its funds have been mainly derived. The chief objects of this Association are:—

(*a*) To initiate, aid, develop and co-ordinate medical scientific research in India, to promote special inquiries and to assist institutions for the study of diseases, their prevention, causation and remedy.

(*b*) To publish papers or periodicals in furtherance of the objects of the Association and to propagate knowledge regarding the causation, mode of spread and prevention of diseases, especially those of a communicable nature.

(*c*) To issue appeals and applications for funds, and to finance inquiries and researches.

23. Other objects of the Association include liaison with other scientific bodies with similar aims; to accept and administer endowments, funds and donations; to grant scholarships to selected individuals for advanced study, etc.

24. The entire control and management of the affairs of the Association are vested in a Governing Body, the composition of which is as follows:—

1. President—The Hon'ble Member of the Governor-General's Council, for the time being, in-charge of the Portfolio of Health.
2. Vice-President—The Secretary, for the time being, of the Department of Health, Government of India.
3. The Director-General, Indian Medical Service.
4. The Public Health Commissioner with the Government of India (Secretary of the Association).
5. The Director, All-India Institute of Hygiene and Public Health, Calcutta.
6. The Director, Central Research Institute, Kasauli.
7. The Director, School of Tropical Medicine, Calcutta.
8. An eminent non-medical scientist elected by the Council of the Indian Science Congress.
9. One representative elected by the Council of State.
10 & 11. Two representatives elected by the Legislative Assembly.

12, 13 & 14. Three representatives of medical faculties of universities who have had training and experience in medical research or public health.

15. The Maharaja of Parlakimedi (life member).

25. Members of the Association may be *ex-officio* holders for the time being of certain offices, or individual donors or subscribers, or may be elected or nominated as members as prescribed in the Rules and Regulations of the Association. The Governing Body appoints at each annual meeting a Scientific Advisory Board of which the Director-General, Indian Medical Service is Chairman, and the Secretary of the Association is Secretary. Members of this Board hold office for one year, but are eligible for re-election. They need not necessarily be members of the Association. There is no restriction as to the numbers appointed to the Scientific Advisory Board, and the Board itself has power to co-opt additional members for any particular meeting or purpose. The Board also has power to appoint Advisory Committees for special subjects and to nominate the Chairman and Secretary of such Advisory Committees. There is no restriction on the number and size of the Advisory Committees appointed, and they have the power, subject to the approval of the Chairman of the Board, to co-opt additional members. It is thus within the competence of the Indian Research Fund Association to obtain the widest possible scientific representation in the actual conduct of the affairs of the Association.

26. In normal times a Research Workers' Conference is held annually which provides a democratic scientific forum in which workers, including the most junior, have the opportunity freely to express their opinions both on scientific matters and on the organization and control of researches sponsored by the Association.

The presence of Public Health Officers and representatives of other interests at these conferences makes it possible to bring into focus the interplay of research and practical health activities. The Indian Research Fund Association, therefore, serves a function, not provided for by other agencies, in bringing into the field of medical research, workers in laboratories other than the Central and Provincial laboratories maintained by Government.

3. *Other Organizations*

27. In addition to the two chief provisions for the organization of research referred to above, there are others of comparatively minor importance. These include the provision for research made by the Endowment Funds of the School of Tropical Medicine, Calcutta; of the Pasteur Institute Associations in India, and of the Indian Council of the British Empire Leprosy Relief Association.

Of the above, the Indian Research Fund Association is the most important organization for medical research in India at the present time.

II. The Central Research Institute and other Central Government Laboratories

1. *The Central Research Institute, Kasauli*

28. The Central Research Institute, Kasauli, was opened in 1906 as a Central Government Bacteriological Laboratory. The original intention was that the staff of the Institute should devote the greater part of their time and energies to the conduct of medical research both in the laboratory and in the field. With the passage of time, however, the ever-increasing demand for vaccines and sera manufactured at the Institute, and other important routine duties, have progressively reduced the time available for research until the unprecedented demand for vaccines and sera for the Defence Department, and the reduction in staff effected since the war, have reduced research activities to the lowest level in its history.

29. The Institute is financed by the Government of India and is controlled by the Director-General, Indian Medical Service, for the Department of Health of the Government of India. In normal times, the revenue from the sale of vaccines and sera manufactured at the Institute covers all running expenses and, at the present time, considerably exceeds this amount.

30. The Institute is provided with two cool rooms. Animal stocks are adequate for present needs. Accommodation for office and stores is already congested. There is no separate Anærobic Block, and work of this kind cannot, at present, be permitted owing to the undesirability of working with anærobic organisms in buildings used for the preparation of vaccines and sera for human use.

The routine work of the Institute consists of:—

(1) The large scale manufacture of T. A. B. Vaccine (chiefly for the Defence Deptt.); Cholera Vaccine (for the Defence Department, Punjab, N.-W. F. P., Kashmir, and other States in Northern India; *plus* emergency supplies for Assam, Burma and Bengal); Anti-rabic Vaccine, both for human and animal use (for the Defence Deptt., Punjab, U. P. and certain States in Northern India); Anti-venom Serum (for the whole of India, including the Defence Deptt.); Sterilized Surgical Ligature (as an emergency supply to the Defence Deptt. in 1942-43).

(2) Laboratory diagnostic work, on a limited scale, for hospitals and practitioners.

(3) The testing of disinfectants for Government of India contracts.

(4) The Director is the Adviser to the Government of India (through the D.G., I.M.S. and the P.H.C.) and is also a member of the Army Pathology Advisory Board and of the Drugs Technical Advisory Board. In addition, advice is sought by many others including Administrative Medical Officers of Provinces and States, private

practitioners and research workers all over India. Advisory work is very heavy and is becoming increasingly more so. It covers a very wide field and often necessitates extensive library work, and even *ad hoc* research.

(5) For many years the Institute has accepted responsibility for the storage and distribution of all imported and indigenous sera for the Defence Department under instructions issued by the Director of Medical Services in India, to whom the Director is Adviser on all matters connected therewith.

(6) The Institute is the receiving and distributing centre, for India, for international standard anti-toxins received from the National Institute for Medical Research, London.

(7) The Institute is a recognized centre for yellow fever inoculation. The potency of the stocks of yellow fever vaccines maintained is estimated quarterly.

(8) A diagnostic unit is maintained, which can proceed at short notice to investigate and verify the suspected occurrences of yellow fever in any part of India.

(9) Since the war, the Institute has been made responsible for the inspection, on behalf of Government, of commercial concerns in India with a view to their recognition by the Government as approved suppliers of various products, including vaccines, sera, sterilized surgical ligature, and sterile solutions for parenteral injection.

(10) Control sterility tests are carried out on a large scale on samples of consignments ordered by Government prior to their acceptance.

(11) Samples of vaccines are tested, as required, on behalf of public health authorities for sterility, specificity and protective value.

(12) The preparation and issue of high-titre sera, standard agglutination suspensions, type sera for blood grouping, etc.

31. At one time, organized bacteriological courses were held at the Institute, but these have been in abeyance for many years. Requests are, however, often received for the training of medical officers or technicians in various branches of work at the Institute. Individuals trained in this way have come from Provinces and States in India, from commercial firms in India and from overseas.

32. The Institute has, for many years, provided accommodation for the library and central stores of the Indian Research Fund Association, and for the office of the *Indian Journal of Medical Research* of which the Director of the Institute is the Editor. One specialized publication assistant assists in editing the *Indian Journal of Medical Research*.

The Institute is organized in six sections which are at present:—

(1) Administrative Section
(2) General Section
(3) Vaccines Section
(4) Rabies Section
(5) Serum Concentration Section
(6) Serum Standardization Section.

The sanctioned staff of the Institute consists of the Director, 3 Assistant Directors, 5 Military Assistant Surgeons and suitable subordinate establishment. The Staff total, in all, about 170.

33. In addition to the above staff, there is at present one supernumerary officer financed by the Indian Research Fund Association who is in-charge of the Serum Standardization Section. One Assistant Directorship is at present unfilled owing to the war. All of the above officers are whole-time employees and none of them is engaged in private practice.

The equipment available is not in all respects satisfactory for the routine work at present in hand. Some of it is old fashioned and badly worn. Equipment for research work is limited.

The Institute maintains an excellent library for the type of work undertaken and these facilities are enhanced by the availability of the library of the Indian Research Fund Association. A trained librarian is maintained.

The Institute has a fine record of research achievement carried out over a period of nearly 40 years and has gained for itself a name of international renown. It is natural that in a small isolated place, such as Kasauli, much of the research carried out has been of a basic nature. Nevertheless, much of this fundamental research has proved to be of importance in practical fields of work. Important field investigations have also been undertaken as, for example, the classical study on the epidemiology of malaria by Christophers in the Punjab and at Singbhum; the investigations on typhus and relapsing fever by Cragg, and later the field inquiries on kala-azar, cholera, etc., financed by the Indian Research Fund Association.

Kasauli has the distinct advantage of a healthy and temperate climate, in which it is possible to work at high pressure throughout the entire year and it is more suitable for many types of work than most plains stations. It is especially suited to the preparation of biological products under ideal conditions and to the breeding and maintenance of healthy animal stocks.

2. *The Malaria Institute of India.*

34. 'The Malaria Institute of India' or as it was formerly named 'The Malaria Survey of India', developed from the Central Malaria Bureau and the Entomology Section of the Central Research Institute, Kasauli. The pressing need for a separate organization to undertake teaching and research on Malariology had been keenly felt in the years immediately after the first Great War. This need was met by the inauguration of the Malaria

Survey of India in 1926 as a semi-permanent inquiry under the Indian Research Fund Association. As in the case of many of the Government Laboratories engaged in other lines of work, the Malaria Survey of India, originally designed as a teaching and research organization, soon began to have forced upon it more and more work of a routine or public health nature. In 1940, the Government of India took over that part of the Malaria Survey of India engaged in duties of this kind. The research activities of the organization continued to be financed by the Indian Research Fund Association. At the present time, therefore, the Malaria Institute of India is made up of a Public Health Section and a Research Section financed by the Government of India and by the Indian Research Fund Association respectively. In practice this division of activities is largely artificial, research going on hand in hand with the public health activities of which it forms an essential part. The functions of the Institute are many and varied but they may be summarized as follows:—

(1) To be fully informed upon all malaria problems, and to advise Government on all issues relative to malaria in India.

(2) To initiate inquiries and investigations on malaria; to carry out such inquiries as Government may for any reason require; to assist provincial organizations in the carrying out of such inquiries as may be undertaken by them, providing such assistance as desired and even, when thought necessary, to lend officers temporarily from the staff to work under local governments.

(3) To undertake systematic research into all the basic facts underlying malaria transmission, prevalence and prevention such as the study of mosquitoes, systematic and bionomical; types of malaria parasites; transmission power of different species of Anopheles; mechanism of infection including the study of endemic and epidemic phenomena, etc.; gradually to complete and organize knowledge on these subjects and to arrange for the making of such knowledge available for practical application, or such other uses as may be desirable.

(4) To carry out epidemiological investigations, mapping of endemicity, study of hyper-endemic and healthy areas, study of malaria statistics on modern lines, and generally to elucidate the underlying principles of malaria prevalence in India.

(5) To advise upon and assist in the carrying out of anti-malaria measures; to study these scientifically and to judge and elucidate their results.

(6) To undertake clinical work on malaria, including treatment; to study serum reactions and allied aids to diagnosis; to study relapse problems, effects of new drugs, etc.

(7) To assist affiliated researches (e.g. kala-azar, filariasis, sandfly fever, dengue, stegomyia work) by identification of material, provision of trained staff and subordinate personnel.

(8) To teach and train officers and others in practical malaria work.

(9) To publish scientific results, useful guides, bulletins, etc.

(10) To keep alive interest in malaria study and prevention and to see that such interest wherever present is nursed and assisted.

35. The existing staff has been reduced owing to the war and is at present inadequate to cope with the functions summarized above. Two appointments for research workers are at present in abeyance and research activities are strictly limited to certain subjects directly connected with the control of malaria in war.

36. In 1942, advantage was taken of the generous offer of the Rockefeller Foundation to donate the equipment of Dr. Paul Russell's Research Unit at Coonoor to form a much needed branch in Southern India. Owing to shortage of staff, it has not been possible to place an officer permanently in charge to control and supervise the activities of the South India Branch. One of the functions of this Branch in South India will be to advise not only the Madras Presidency and the neighbouring Indian States, but also the numerous Tea and Coffee Plantations and other industrial concerns who frequently apply for advice on malaria-control measures to the Director of the Pasteur Institute, Coonoor.

37. Although the Malaria Institute has been in existence for less than 20 years, it has carried out a large volume of research work of the highest quality and has established for itself a reputation for malaria research which is probably unequalled by any other single organization in the world.

The original headquarters of the Malaria Institute were located in the buildings of the Central Research Institute, Kasauli. In addition, a large Experimental Station was maintained in a hyper-endemic area at Karnal for the purpose of conducting field researches, translating the results of research work into practice, and conducting advanced courses of instruction on malaria. In 1936, the Malaria Institute was required to assume responsibility for the direction and supervision of a large scale anti-malaria project in Delhi. This necessitated the residence at Delhi of a considerable proportion of the staff of the Institute, and in 1940 the Government of India placed a suitable building in Delhi at the disposal of the Institute. Subsequently, the Experimental Station at Karnal was given up and the work previously carried out both at this Station and at headquarters in Kasauli was transferred to Delhi. The Institute still retains its library, stores and two laboratories at Kasauli.

38. The courses of instructions on malariology now given to Medical Officers of the Army, Central and Provincial Government

services, railways, industrial concerns, etc., have been of great value in spreading knowledge of malaria throughout India and in stimulating malaria investigation and control in many parts of the country. In addition to these courses, special classes of instruction have been held regularly for the training of engineers in the principles and practice of malaria prevention. Since the outbreak of the war, special courses have been held for medical officers of the Armies, Navies and Air Forces of British, American and other allied countries. The Director of the Institute is Consultant Malariologist to the Army in India.

3. *The Biochemical Standardization Laboratory*

39. This Laboratory was organized in 1936 in order to train personnel in the technical methods of testing pharmaceutical and other products against the time when legislation would be introduced to control their manufacture by commercial firms in India. The intention was that when the Drugs Act became law, the Biochemical Standardization Laboratory would be re-constituted as the Central Drugs Control Laboratory. Although the Drugs Act was passed in 1940 and the Drugs Rules, 1945, have recently been promulgated by the Government of India, this legislation has not yet been brought into operation. The Laboratory is organized in sections for work on Pharmacology and Bio-assay, Pharmaceutical Chemistry and Biochemistry.

4. *The Imperial Serologist*

40. The Imperial Serologist with the Government of India is provided with accommodation in the buildings of the Calcutta School of Tropical Medicine. This accommodation is very badly needed by the School itself.

Routine work consists chiefly of serological investigations undertaken for medico-legal purposes but, in addition, a large number of Wassermann reactions are performed. In addition to his routine duties the Imperial Serologist gives a limited number of lectures on serology to students of the School of Tropical Medicine and of the All-India Institute of Hygiene & Public Health.

Despite a heavy burden of routine work and very limited accommodation, a considerable volume of research work has been done in this Laboratory chiefly in relation to serological problems of medico-legal importance.

III. Medical Research in Laboratories maintained by Provincial Governments

1. *Laboratories maintained by the Government of Madras*

41. *The King Institute of Preventive Medicine, Guindy.*—The King Institute was founded as a provincial Public Health Laboratory for the Madras Presidency in 1903. The Institute itself stands in a spacious compound at Guindy, about five miles from Madras City, and consists of a main building and a group of subsidiary buildings. Additional buildings have been added from

time to time in order to provide accommodation for the gradually increasing volume of work undertaken. The accommodation available was adequate until the outbreak of the present war. Recently, sanction has been obtained for the construction of additional buildings. The accommodation provided for the routine and research activities of the Institute is well designed and well equipped.

42. The chief functions of the King Institute, Guindy, are routine public health laboratory work, advisory work and research. The routine functions include:—

(1) The conduct of bacteriological, serological and pathological examination of specimens from all hospitals in Madras City and from Government hospitals and dispensaries throughout the Madras Presidency. Specimens are also received from Mission Hospitals.

(2) The manufacture of bacterial vaccines used in the prophylaxis and treatment of diseases and also the manufacture of sterile solutions intended for injection.

(3) The manufacture and distribution of therapeutic sera to various hospitals in the Presidency.

(4) The manufacture and distribution of vaccine lymph for the use of the Public Health Department.

(5) The conduct of public health laboratory work, such as the examination of water samples from protected and projected water-supplies in the Province.

(6) The conduct, by the Government Analyst, of examinations of foodstuffs in connection with the administration of the Prevention of Adulteration Act.

(7) Blood Bank for the City of Madras.

43. Advisory work is carried out on a large scale and includes technical advice to the Government of Madras, including the Medical, Public Health, Fisheries and Hydro-electric Departments in connection with medical and public health problems of all kinds and with problems connected with existing or projected water-supplies. Many other matters affecting the public health are referred to the Institutue by the Public Health Department.

44. Research work has always been an important function of the Institute and among the subjects on which special research has been undertaken are: cholera, typhoid, plague, leprosy, diphtheria, virus diseases, malaria, filariasis and protozoal and helminthic diseases, and subjects relating to water-supplies, including water bacteriology, algology and endemic fluorosis.

45. A prominent feature of the work of the Institute is the maintenance of three special "Investigation Units", which being mobile, can be despatched at short notice to investigate in the field any outbreaks of epidemic disease which may occur in the districts, so that suitable preventive measures may be taken without delay. Since 1922, when the first of these units was set up, they have undertaken special inquiries on dysentery, relapsing fever, typhoid

fever, cholera, malaria, gastro-enteritis, kala-azar, filariasis, glandular fever, diphtheria, sprue, jaundice, beri-beri, meningitis, plague, stomatitis, etc.

46. The work of the Institute is organized in various sections, each of which is in charge of a specially qualified officer. There are, at present, 12 sections:—

(1) Clinical Bacteriology and Media.
(2) Serology.
(3) Auto-vaccines and Stock Cultures.
(4) Large-scale manufacture of Prophylactic Bacterial Vaccines.
(5) Manufacture of Sterile Solutions for Injection.
(6) Bacteriophage.
(7) Manufacture of Vaccine Lymph.
(8) Manufacture of Anti-toxic Sera.
(9) Public Health Section (including water analysis, etc.).
(10) Chemical Section.
(11) Government Analyst.
(12) Blood Bank and Plasma Processing Centre.

47. The work of the above sections is under the control of the Director who is assisted by 4 Assistant Directors each of whom is in charge of a group of sections. In addition, there are 15 medical officers, 15 senior non-medical assistants and a large staff of laboratory assistants, technicians, clerks, store-keepers, overseers, animal attendants, etc. The Government Analyst has his own separate staff.

Regular courses of instruction are organized at the Institute for:—

(*a*) students taking the Bachelor of Sanitary Science Degree of Madras University, who receive instruction in the manufacture and use of vaccine lymph;
(*b*) students undergoing training for the Government Diploma in Laboratory Sciences, who receive advanced training for one month in serological methods and
(*c*) students of the Sanitary Inspector class who are given training in vaccination work.

48. In addition, special instruction is given to medical graduates in general bacteriological methods, usually for a period of three months, during which they are attached to the officer-in-charge of the appropriate section. Candidates desirous of undergoing training as laboratory attendants may be admitted for special instruction.

49. The Institute possesses a good library, the books and periodicals in which are well chosen for the type of work undertaken, namely, medicine, public health, bacteriology, parasitology, immunology, analytical chemistry, etc. The library is in charge of a trained librarian.

50. No special staff is maintained exclusively for research work; but research is undertaken by individual workers in addition to the routine duties allotted to them. A number of special research inquiries financed by the Indian Research Fund Association have been carried out at the Institute under the supervision of the Director. Most of these inquiries have, in the past, produced valuable results as, for example, the special investigations carried out on virus diseases, including vaccinia virus, sandfly fever virus, typhus, dengue, trachoma, etc.; cholera, including studies on the vibrio, epidemiology, treatment and the value of prophylactic inoculation; plague, including epidemiology and the value of prophylactic inoculation; malaria, including experimental laboratory investigations on immunology, protozoology and treatment; endemic fluorosis, the occurrence of which was first brought to notice by the Institute and the causes of which have since been elucidated; water and sewage bacteriology, some of which has been carried out under the auspices of the Water and Sewage Purification Committee; investigations on the algal flora in water-supplies originally financed by the Indian Research Fund Association and now carried out as a routine by a permanent section of the Institute. A continuous research activity is the evolution of newer and better technical methods in relation to the conduct of the routine work of the Institute.

51. It will be clear from this brief summary of the advisory, routine and research activities of the Institute and from the great expansion of its activities which has taken place over the last 40 years, that the Institute has played a very important part in the development of public health work in the Madras Presidency.

The conditions of manufacture of biological products at the Institute are of a very high standard. The section for the preparation of vaccine lymph, for example, is probably better organized and equipped than any other in India and is considered to be equal to any in existence elsewhere.

2. *Laboratories maintained by the Government of Bombay.*

52. (*a*) *Haffkine Institute, Bombay.*—The Haffkine Institute was opened in old Government House, Parel, in 1900 and has since been modified and extended to meet the growing needs of the Province. It is controlled and financed by the Government of Bombay.

The primary functions of the Haffkine Institute are to carry out routine public health laboratory work, to undertake the large-scale manufacture of vaccines, sera and other biological products, and to undertake research work.

The routine work of the Institute includes the large-scale manufacture of plague, cholera, T.A.B. and anti-rabic vaccines; the manufacture of anti-toxins and toxoids, including tetanus, diphtheria, and gas-gangrene anti-toxins, tetanus and diphtheria toxoids and anti-dysentery and anti-plague sera; clinical pathology for diagnostic purposes, a prominent feature of which is that work in connection with such infectious diseases as enteric, dysentery,

cerebro-spinal fever, diphtheria, typhus and malaria is carried out free, even for private practitioners; routine analyses of food and water as required by the Public Health Department of the Government of Bombay; tests on the nutritional value of foodstuffs and advice to Government; large-scale manufacture of solutions intended for parenteral injection; and the provision of a blood bank.

At the present time the Institute is organized in nine departments, namely: Vaccine Department; Serum and Anti-Toxin Department; Pharmacology Department; Biochemistry Department; Chemotherapy Department; Entomology Department; Nutrition and Experimental Pathology Department; Virus Diseases Department; and Clinical Pathology Department. In addition, there are five associated field inquiries, namely (1) treatment of plague with sulphathiazole; (2) investigation of plague in Sholapur and adjoining districts; (3) leptospirosis; (4) typhus; (5) nutritional factors in hepatic cirrhosis.

The Haffkine Institute is exceptionally well equipped both for routine and research work, and especially for public health laboratory work, the preparation of biological products, and clinical work. Special features of the Institute's equipment are constant-temperature rooms at 0°C., 4°C., 23°C., 28°C. and 37°C. Five rooms are being air-conditioned in connection with the blood bank and the preparation of anti-toxins. Ample laboratory accommodation for all purposes is available and there are excellent animal houses, including stables and paddocks for 150 horses.

The staff of the Institute includes the Director, 8 Assistant Directors, each of whom is in charge of a department, some 27 officer assistants, including graduate technicians, and an adequate subordinate staff.

The activities of the Haffkine Institute have increased rapidly in recent years and the annual budget has risen from approximately Rs. 3 lakhs to Rs. 8 lakhs. The Institute is still expanding and at the present time some Rs. 12 lakhs are being spent on improved accommodation and equipment. When this work is complete the budget will be increased. A point of particular interest is that the whole of the revenue of the Institute from sale of manufactured products and for other work is made available for maintenance and for expansion and development.

The Haffkine Institute is also a training centre for Medical and Public Health Officers and Sanitary Inspectors in anti-plague measures.

In addition to the very large volume of routine work carried out, research work is undertaken on a wide variety of subjects No special research staff is retained but the work of the Institute is so organized that the officers in charge of the various departments and their assistants, have sufficient time to undertake research in addition to their routine duties. These officers are selected primarily on the basis of their aptitude for research work. Emphasis is placed chiefly on applied research in relation to im-

proved production of biological preparations and health problems of special importance to the Province. For many years the Institute has been the chief centre in India for the investigation of plague, and measures for its prevention and treatment. More recently research work has been extended to cover a much wider field and at the present time work is being carried out on chemotherapy, nutrition, malaria, physiology, entomology, virus diseases and other subject. Most of the research work done is financed from the Institute budget but four inquiries are financed by the Indian Research Fund Association namely, the Plague Inquiry, the work on Pharmacology of Anti-Malarial Drugs, the Typhus Inquiry and the Inquiry into Nutritional Factors in Hepatic Cirrhosis.

The Haffkine Institute provides excellent facilities for medical research because of its ample laboratory accommodation, good equipment, fine animal houses and comprehensive library. The latter contains some 12,000 bound volumes and receives over 200 journals and periodicals. Apart from its own resources the Institute also benefits from its close proximity to and association with, the Seth G. S. Medical College and a group of hospitals including the Tata Memorial Hospital with its well-equipped research laboratories. Investigations on a wide range of subjects have been carried out in recent years and a number of important contributions to the literature have been made. The Government of Bombay awards four research scholarships each year.

(*b*) *Public Health Laboratory, Poona.*—This laboratory is engaged in the conduct of public health laboratory work, such as chemical and bacteriological analyses of water, and is adequately equipped for routine work of this kind. No research work is undertaken and the accommodation and equipment available are not such as to make this laboratory a suitable research centre.

(*c*) *Vaccine Lymph Depôt, Belgaum.*—Vaccine lymph is prepared from cow-calves on a large scale in accordance with accepted routine methods. The accommodation, equipment, appointments and technical conduct of the work are of a high standard. The Depôt would be capable of development into a centre for virus research work.

3. *Laboratories maintained by the Government of Bengal.*

53. Bengal lacks an institute of preventive medicine such as the Haffkine Institute in Bombay or the King Institute in Guindy. The Government of Bengal has, however, provided for the production of essential biological products and the conduct of public health laboratory work in piecemeal fashion.

(*a*) *The Vaccine Lymph Depôt, Calcutta.*—Primary vaccination in Bengal is compulsory, but the evidence available indicates that the arrangements for carrying it out are so unsatisfactory that only a small proportion of the infant population is vaccinated while re-vaccination in the older age-groups is an even rarer occurrence. Nevertheless, the potential requirements of vaccine-lymph for the province apparently cannot be met from the Government Vaccine Lymph Depôt in Calcutta during epidemic

periods and it is necessary to supplement the output of this Depôt by obtaining additional supplies from other provinces.

The Vaccine Lymph Depôt in Calcutta is located on the ground floor of a rented house, the upper floor of which is used for the manufacture of cholera vaccine. The buildings are in a poor state of repair, and the rooms are ill-adapted to the work, having been constructed for residential purposes. The available accommodation is insufficient, the fittings and equipment are poor, and the technical conduct of the work is not, in all respects, satisfactory. There is a spacious compound, but the housing provided for the calves in quarantine, the calves in reserve, and the calves under treatment, are badly designed and poorly equipped. For example, there are no proper stalls or fittings to prevent the vaccinated calves from lying down, or from licking themselves or each other. In brief, the conditions under which vaccine lymph is prepared in Calcutta leave a great deal to be desired. The work is carried out in a routine, rule of thumb manner and no attempt is made to conduct research or otherwise to improve the present conditions of manufacture.

The maximum output of vaccine lymph under present conditions is approximately 10 million " doses " per annum.

(*b*) *The Cholera Vaccine Laboratory, Calcutta.*—The Cholera Vaccine Laboratory is located on the upper floor of the rented building used for the Vaccine Lymph Depôt. The accommodation available is quite unsuited to the work in hand and is grossly overcrowded. The rooms are mostly small, badly lighted and are in a poor state of repair. The technical conduct of the work is not, in all respects, satisfactory. Despite the many criticisms which could be made of the technique at various stages of manufacture it was claimed that contaminations rarely occurred. This is surprising considering the frequency with which contaminations occur in other Government Institutes where the conditions of manufacture are incomparably superior. The laboratory was not able to meet recent emergent demands and additional supplies had to be obtained from Government laboratories elsewhere in India and from a commercial firm in Calcutta. The difficulty experienced by this overcrowded and ill-equipped laboratory in adapting itself to greatly increased output can well be understood.

The maximum annual output is approximately 4,500,000 c.c. of vaccine. Manufacture is undertaken for only five days in each week. No research work is undertaken in this laboratory and on account of the poor accommodation and equipment available, it would be inadvisable to do so.

(*c*) *The Pasteur Institute, Calcutta.*—The Pasteur Institute, Calcutta, like the two laboratories referred to above, is located in a double-storied residential building. The ground floor is used for the manufacture of anti-rabic vaccine and as a treatment centre, while the upper storey is used as the Superintendent's living quarters. The buildings are in a very bad state of repair.

The anti-rabic vaccine prepared is 1 per cent. carbolized sheep-brain vaccine. All other institutes in India now use a 5 per

cent. sheep-brain suspension. It has frequently been suggested that the strains of rabies virus prevalent in Bengal are less virulent than those in other parts of India, and it is presumably for this reason that the Pasteur Institute, Calcutta, has not adopted the stronger vaccine. The mortality from rabies among patients treated with 1 per cent. vaccine in Bengal is no higher than that reported elsewhere in India.

The Institute is capable of producing all the anti-rabic vaccines likely to be required in Bengal and is at present turning out approximately 10,000 courses of anti-rabic treatment a year. The process of manufacture of the vaccine was not seen by us, but it was apparent from an inspection of the rooms used for the purpose, and from the information given by the Superintendent, that the conditions of manufacture could not be regarded as satisfactory.

The staff of the Institute consists of a Medical Superintendent, two medical assistants, 4 laboratory assistants and appropriate clerks and menial staff. This may be considered a generous allotment for the routine work in hand, but in spite of this no attempt is made to undertake research, or otherwise to improve methods of manufacture of the vaccine.

(*d*) *The Bengal Public Health Laboratory, Calcutta.*—This laboratory occupies very congested accommodation in the already overcrowded Calcutta School of Tropical Medicine. The Laboratory is concerned in the production of biologicals, only in so far as it is responsible for carrying out sterility tests on the products of other Government laboratories.

The main functions of the Laboratory are to carry out routine public health laboratory work including the chemical and bacteriological examination of water, analysis of foodstuffs sent to the Laboratory by local bodies under the provision of the Bengal Food Adulteration Act, and bacteriological work such as the special investigation of epidemic diseases and the examination of disinfectants.

The Laboratory is organized in two main sections: (1) Chemistry Section (for food and water analyses), and (2) a Bacteriological section.

The staff consists of a Director who is also professor of Public Health Laboratory Practice at the Calcutta School of Tropical Medicine, a Public Analyst, 9 Assistant Analysts (chemistry), and two Bacteriologists, together with a staff of laboratory assistants, clerks, sweepers and peons and other inferior staff. The equipment of the Laboratory is adequate for the routine duties carried out. Research has been attempted from time to time, but at present, any serious attempt at scientific investigation is effectively precluded by lack of accommodation, lack of equipment, and lack of a proper animal house.

Apart from the necessity for increased accommodation for the routine activities of the laboratory, the space at present occupied is very badly needed by the School of Tropical Medicine.

4. *Laboratories maintained by the Government of the United Provinces.*

54. In addition to the Provincial Hygiene Institute at Lucknow, provision is made for the manufacture of vaccine lymph at the Vaccine Lymph Depôt, Patwa Dangar, near Naini Tal; laboratory work in connection with the Provincial Food Adulteration Act is carried out at the Laboratory of the Public Analyst in Lucknow; and routine medico-legal and excise work is undertaken at the Chemical Examiner's Laboratory, Agra. These various organizations perform the functions of one of the larger provincial institutes, such as the King Institute, Guindy.

(*a*) *The Provincial Hygiene Institute, Lucknow.*—The Provincial Hygiene Institute, Lucknow, is housed in a modern, well-constructed building immediately adjacent to the King George Medical College, Lucknow. In the early years of its existence, courses for the Diploma in Public Health were held but these were discontinued when the All-India Institute of Hygiene and Public Health was opened at Calcutta. Courses of instruction are still given to Officers and sanitary inspectors of the Provincial Public Health Service; students of the medical college and health visitors also receive instruction in hygiene at the Institute. The staff of the Institute, though small, is well qualified, and experienced in the type of work undertaken. Accommodation and equipment are barely sufficient for present needs. In addition to routine public health laboratory work the Institute meets the demands for cholera vaccine for the entire Province, and at present provides accommodation for the Provincial Blood Bank. These two latter activities were not envisaged when the Institute was built sixteen years ago, with the result that the available accommodation is already becoming overcrowded. There is, however, ample room for expansion.

Manufacture of cholera vaccine at the Institute was commenced in 1931 and the annual output is now approximately 1,000,000 doses a year. The rooms allotted for this work provide sufficient accommodation; the equipment is good and the supervision and technical conduct of the work are of a high standard.

An important function of the Institute is to undertake special investigations into public health problems in the field as occasion demands. For this purpose a team of selected workers is mobilized, the selection of the workers and the equipment taken depending upon the nature and extent of the problem to be investigated. In the past, outbreaks of epidemic dropsy, meningitis, cholera, plague, food-poisoning, etc., have been investigated in this way. Research work has also been carried out at the Institute itself during recent years, the subjects studied including standards for turbidity of raw water admitted to filter-beds; researches on typhoid fever; work in connection with helminthic surveys at the Health Unit, Partabgarh, and at the sewage farms at Allahabad and Lucknow. There is a small library in the Institute which consists mainly of standard textbooks and a limited number of public health periodicals; the Medical College library is available for consultation in a nearby building.

(*b*) *The Vaccine Lymph Depôt, Patwa Dangar,* is ideally situated among beautiful surroundings at an elevation of 5,300 ft. The Depôt consists of laboratories, animal houses and residential buildings scattered over an estate of some 23 acres and is completely self-contained. Its sole function is to manufacture and issue all vaccine lymph requirements for the Province. Maximum output is about 3,700,000 " doses " per annum. Manufacture is normally carried out only from 1st October to 31st December each year. Experience has shown that manufacture can be continued satisfactorily from October to March inclusive but that the yield and quality of lymph is poorer during the hotter months of the year. Lymph is prepared from bull-buffalo calves but in other respects the methods employed are those in common use elsewhere. The process of manufacture was not observed. Before issue the lymph is subjected to bacteriological examination and is tested for potency on animals as well as by field trial at selected centres. Accommodation and equipment are reasonably satisfactory for routine work. No research work is done but there is ample room for expansion for this purpose. Supplies of water and electricity are obtained from Naini Tal but the lack of a gas supply is a notable defect.

(*c*) *The Chemical Examiners' Laboratory, Agra,* is housed in a residential building. Accommodation is insufficient for the wide range of routine functions performed. A notable deficiency is the absence of an animal house. Equipment is reasonably satisfactory for most of the routine work undertaken but the laboratory lacks a spectrograph ultra-violet apparatus, X-ray, large-scale extractors, muffle furnace, etc. Facilities for research are practically non-existent at the present time owing to lack of accommodation and heavy pressure of routine work. Library facilities are very meagre. Despite these handicaps some research work is in progress chiefly in relation to the improvement of routine procedures followed in the Laboratory. The Chemical Examiner expressed the opinion that medico-legal work in India is carried out in a most unsatisfactory manner and emphasized the need for a central institute to undertake research and provide a training centre for this important subject.

(*d*) *The Public Analyst's Laboratory, Lucknow.*—The Professor of Chemistry, University of Lucknow, holds the office of Public Analyst and accommodation is found within the Department of Chemistry. He is assisted by one whole-time Assistant Public Analyst and seven or eight Analyst Assistants. Routine work is confined to analysis of foodstuffs under the Provincial Food Adulteration Act. Accommodation is very limited and equipment, while good for most of the routine work, is deficient as regards a spectroscope, ultra-violet apparatus and vitamin-estimation apparatus. Owing to heavy routine duties, lack of space and equipment, research is not undertaken apart from occasional investigations for the solution of specific problems referred to the Laboratory. In the opinion of the Public Analyst and his assistants, research is badly needed to evolve better methods for the

detection of food adulteration, for the quantitative estimation of certain ingredients, and to establish standards. In regard to the latter the need for research has been stressed by a special committee of the Central Advisory Board of Health in a report published in 1939.

(*e*) *Provincial Blood Bank, Lucknow.*—The Provincial Blood Bank was opened in 1942 under the technical direction of the Professor of Pathology, Medical College, Lucknow. Its main functions are to collect, process, store and supply transfusion material to hospitals and dispensaries and to train medical officers in approved methods of blood transfusion and blood matching. The main processing centre is located in the Provincial Hygiene Institute and is well staffed and equipped.

5. *Laboratories maintained by the Government of the Punjab*

55. Although the Punjab lacks an Institute of Preventive Medicine organized on as broad a basis as the Haffkine Institute, Bombay, or the King Institute, Guindy, most of the functions performed by one of the larger institutes are provided for in one or other of the following laboratories:—

(*a*) The Punjab Epidemiological Laboratory, Lahore.

(*b*) The Vaccine Institute, Lahore.

(*c*) The Punjab Provincial Bacteriological Laboratory, Lahore.

(*d*) The Chemical Examiner's Laboratory, Lahore.

The Central Research Institute, Kasauli, although a central government institution, is situated in the Punjab and supplies the Province's requirements of vaccines and sera.

(*a*) *The Punjab Epidemiological Laboratory, Lahore,* is accommodated in buildings of the King Edward Medical College, Lahore. The Laboratory performs the routine functions of a public health laboratory and is well equipped for this purpose. In addition, it functions as an investigation and advisory bureau for the Provincial Public Health Department and serves as a training centre for sanitary inspectors. Investigation units have been mobilized from the resources of the Laboratory from time to time and important field inquiries have been undertaken in this way especially on hookworm, malaria and cholera. Special units are set up from time to time in connection with large fairs. The Laboratory issues an annual forecast of the probable occurrence of epidemic malaria in various parts of the Province and performs the functions ordinarily undertaken by a Public Analyst's laboratory.

(*b*) *The Vaccine Institute, Lahore,* is concerned chiefly with the production of vaccine lymph to meet the needs of the Province. Supplies are also made to other areas including Afghanistan and Persia. Accommodation and equipment are satisfactory for the production of vaccine lymph according to recognized routine procedures. Buffalo-calves are used. Research work is also carried out, an example of which is the cultivation of vaccine virus on chick embryo.

(*c*) *The Punjab Provincial Bacteriological Laboratory, Lahore,* is a diagnostic laboratory which undertakes clinical, pathological and histological examinations for the Province as a whole.

(*d*) *The Chemical Examiner's Laboratory, Lahore,* performs routine medico-legal work, and, in addition, undertakes analysis of foodstuffs.

(*e*) *Mobile Research Laboratory, Lahore.*—The Government of the Punjab has recently sanctioned the creation of a Mobile Research Laboratory with its own separate staff and equipment which will be based on the Pathology Department of the King Edward Medical College. This unit will be available to undertake field investigations any where in the Province and the intention is that it should spend as much time as may be necessary to investigate the particular problem in hand. The staff of this Mobile Laboratory will undertake all of the field investigations necessary, and, in addition, will collect material which can be more exhaustively investigated in the Department of Pathology or in any other department of the Medical College. The policy regarding the use of this Mobile Laboratory will be laid down by a small committee consisting of the Inspector-General, Civil Hospitals, the Director of Public Health and the Principal of the Medical College.

6. *Laboratories maintained by the Government of Assam.*

56. (*a*) *The Pasteur Institute and Medical Research Institute, Shillong.*—The proposal to establish a Pasteur Institute in Assam was first put forward in 1906 by the Assam Branch of the Indian Tea Association. The continued efforts of this Association in this direction resulted, in 1910, in the allocation of a part of the King Edward VII Memorial Fund for the construction of an institute. This was supplemented later by a grant of Rs. 40,000 from the Indian Research Fund Association to establish a library and provide equipment for the Institute. The buildings were completed and the Institute opened as an anti-rabic treatment centre at Shillong in 1917. At the present time the main institute and certain auxiliaries are located on the outskirts of Shillong at an elevation of about 5,000 ft. The institute buildings are situated in a compound about 10 acres in extent. The institute and its auxiliaries consist of:—

(1) The main laboratory.

(2) A clinical research hospital with some 20 beds.

(3) A malaria training centre connected with the Research Section of the Assam Medical Research Society.

There are good staff quarters, animal houses, etc., and the large compound offers space for considerable future expansion.

The work of the Institute is organized in three main sections:—

(1) *Rabies Section.*—This provides a centre for anti-rabic treatment at which some 2,500 patients are treated annually. Medical Officers in charge of public and private anti-rabic treatment centres are trained here.

Large-scale manufacture of anti-rabic vaccine is undertaken and supplied to the ever-increasing number of treatment centres throughout the Province.

(2) *Laboratory Diagnosis Section.*—The Institute serves as a Provincial Laboratory for routine diagnostic work including microscopical, cultural and serological work and the histological examination of tissues. Over 4,000 examinations of this kind are carried out annually.

(3) *Vaccine Manufacturing Section.*—This section is engaged chiefly in the large-scale manufacture of prophylactic cholera and T. A. B. vaccines to meet the needs of the Province. The preparation of a combined cholera-dysentery bacteriophage is undertaken on a large scale and this product is supplied not only to Assam but also to practically the whole of India. Demands for these products are very variable and it is necessary to maintain large reserves to meet the excessively high demands received during epidemics. In 1935 and again in 1936, nearly one million ampoules of cholera bacteriophage were issued, while in 1938 nearly one million c.c. of cholera vaccine were issued.

The small clinical research hospital is an important part of the Institute and a great deal of experimental work has been carried out in it, principally on the treatment of kala-azar by antimony compounds, and on the treatment of cholera and dysentery by bacteriophage.

In 1930, the Research Section of the Assam Medical Research Society was established at the Institute and since that time considerable work on the epidemiology, prevention and treatment of cholera and on the control of malaria in the field, has been carried out.

The officers of the Institute have always been members of the Medical Research Department. The standards maintained in the production of biological preparations are on a par with other central and provincial institutes similarly staffed. The interchange of officers between these institutes has resulted in the dissemination of the best and most up-to-date procedures among the various institutes.

The Pasteur Institute, Shillong, has a good record in the field of research. This has been carried out principally on diseases of particular importance to Assam, especially kala-azar, cholera, dysentery, malaria, Naga sores, etc. Among the better known of these researches may be cited the work of Shortt, Knowles and others on the treatment of kala-azar and on the transmission of this disease by the sandfly; the work of Morrison on the treatment of cholera and dysentery by bacteriophage, and on the technique for large-scale manufacture of this product evolved by him; and the work of Rice and others on the investigation and control of malaria in Assam. The Institute has also played an important part in the 8-year programme of cholera research

financed by the Indian Research Fund Association. The part played in these investigations by members of the staff of the Institute, including Anderson, Pandit and others, concerned chiefly the isolation of various types of cholera 'phage and their influence on the characters of *V. cholerœ*.

(*b*) *The Provincial Public Health Laboratory, Shillong,* is closely linked with the Pasteur Institute though it is not an integral part of it. This laboratory carries out routine analyses of food, water, etc.

IV. Medical Research in Teaching Institutions.

1. *Post-graduate Teaching Institutions.*

57. (*a*) *School of Tropical Medicine, Calcutta.*—The School of Tropical Medicine was founded through the initiative of Major-General Sir Leonard Rogers, I.M.S., and was opened in Calcutta in 1922. The teaching facilities available depend on (1) the School proper which is housed in a well-designed and constructed four-storey block, properly equipped to undertake teaching and research on a wide variety of subjects, and (2) a small but well-designed and equipped Hospital (Carmichael Hospital for Tropical Diseases) which provides beds for over one hundred men, women and children suffering from a varied selection of tropical diseases. The patients admitted to this hospital are carefully selected so as to provide a representative range of clinical material for teaching and research. Approximately 1,000 in-patients and 25,000 out-patients are treated at the hospital every year. The facilities thus provided for teaching and research on tropical diseases are probably unrivalled in any part of the world.

The buildings for the School proper were erected by the Government of Bengal who received a grant of Rs. 5 lakhs towards the initial cost from the Government of India. Funds for the erection of the Hospital for Tropical Diseases and for the conduct of research were collected from public and private sources by Sir Leonard Rogers. At the present time, certain departments of the School are staffed and maintained by the Government of Bengal, while others are financed largely from the Endowment Fund of the School or from considerable sums of money donated each year by various industrial concerns. A number of research inquiries are also financed by the Indian Research Fund Association. The activities of the School have expanded rapidly till at the present time there are nearly 20 departments, each busily engaged in the conduct of research in addition to routine teaching work. The research work undertaken covers tropical medicine, pharmacology, entomology, chemistry, pathology, bacteriology, protozoology, hæmatology, diabetes, filariasis, helminthology, dermatology, kala-azar, leprosy, bowel diseases, indigenous drugs, nutrition etc.

Each of the subjects enumerated appears to enjoy the status of a separate department. The Professor of Tropical Medicine acts as co-ordinator of research. The School has a fine record of research work covering a very wide range of subjects. Much of the

work done has a clinical bearing and this is of particular importance inasmuch as many of the other institutions in India engaged on medical research are largely or entirely divorced from clinical material.

Every department of the School is, at present, suffering acutely from lack of adequate accommodation and it is true to say that the work being carried out is seriously handicapped by lack of space. The various departments of the School are at present so overcrowded that it would be impossible for them to accommodate any appreciable number of graduates for advanced training in research.

The School is primarily a teaching institution and courses of instruction are given which are particularly suited to the needs of India. Two courses of instruction are given each year: one of six months' duration for admission to the Diploma of Tropical Medicine of the Faculty of Medicine and Hygiene, Bengal; the other of three months' duration for the examination of Licentiate in Tropical Medicine of the same Faculty. Admission to the longer course (D. T. M.) is, in general, confined to persons holding medical qualifications recognized by the General Medical Council of Great Britain and to Government Medical Officers. Admission is decided by a special Selection Committee at the School.

The School also admits qualified students desirous of undertaking special lines of study or research for periods not exceeding six months, provided that the attendance of such students does not interfere with the prescribed courses of study, and subject to the approval of the Surgeon-General with the Government of Bengal.

Three courses, each of two weeks' duration, are arranged each year for the post-graduate study of leprosy and these courses are sponsored by the Indian Council of the British Empire Leprosy Relief Association.

In addition to the regular teaching at the School, lectures and demonstrations on protozoology and helminthology are given by members of the staff to students attending the D.P.H. courses at the All-India Institute of Hygiene and Public Health.

Since the beginning of the war, the School has organized special intensive courses of instruction in tropical medicine for specialists in medicine of the British and American armies, and up to the present time over one hundred officers have received instruction in this way. A limited number of officers have also been admitted to individual laboratories of the School for instruction in special subjects.

The School of Tropical Medicine provides one of the few examples in India where advanced teaching and research are carried out side by side, where advantage is taken of the excellent clinical material available, and where students are trained in an atmosphere of research work.

(*b*) *The All-India Institute of Hygiene and Public Health.*— This Institute is housed in a modern, well-equipped building

immediately adjacent to the Calcutta School of Tropical Medicine. It is staffed and maintained by the Government of India.

The Institute was opened in 1932, for the purposes of " investigating methods of applying knowledge for medical protection to large groups of the community " and of training students in these methods. There are six teaching sections, namely:—

(i) Public Health Administration.

(ii) Vital Statistics and Epidemiology.

(iii) Microbiology (including bacteriology; immunology and serology; filterable viruses and the rickettsias; medical entomology; protozoology and helminthology).

(iv) Biochemistry, Nutrition and Physiological Hygiene (including public health chemistry and physiology applied to public health).

(v) Sanitary Engineering.

(vi) Maternity and Child Welfare.

Regular Post-graduate courses are held leading to the following diplomas: D.P.H.; D.P.H. & Hy.; D.M.C.W. Facilities are also available for students to prepare for the D.Sc. degree in public health of the Calcutta University. In addition, special courses are offered by each teaching section for workers desirous of undergoing training in a particular subject, and, since the Institute was opened, twelve such courses have been given. The Institute collaborates with the School of Tropical Medicine in its regular courses.

The laboratories, lecture theatres and museum are, in normal times, well adapted for teaching and research. At present a considerable proportion of the available accommodation has been given over for emergency work, particularly for the Calcutta Blood Bank and for the large volume of routine work undertaken on behalf of the Defence Department by the Biochemical Standardization Laboratory which is temporarily housed in the Institute. The facilities for teaching and research are enhanced by the opportunities provided for demonstrations, teaching and research at the Health Centre, Singur. The library contains some 12,000 bound volumes and receives 124 journals selected so as to be complementary to, and avoid overlap with, those received in the library of the School of Tropical Medicine.

Special attention is now being given to the development of the primary function of the Institute, namely, the establishment of a controlled experimental area where methods of applying knowledge to large community groups can be investigated. The area selected for this purpose centres round the Health Centre at Singur. The scheme is a collaborative one between the Government of India and the Government of Bengal and administrative responsibility for it is vested in the Institute. It will thus be possible for the various sections of the Institute to undertake investigations on methods of applying knowledge of their particular subjects to large communities. The various sections of the Institute, as at present

constituted, are not sufficiently comprehensive to cover all aspects of public health. New sections of Physiological Hygiene and Industrial Hygiene are required and the Sanitary Engineering Section requires to be strengthened in view of the primary importance of environment on health, particularly in India.

The work of the Institute is so organized that the staff of each section has ample time for research—probably as much as two-thirds of their time. In the decade since the Institute commenced to function, some 100 scientific papers have been published on a variety of subjects including epidemic dropsy, malaria, tuberculosis, kala-azar, nutrition, biochemistry and the clinical aspects of maternity and childwelfare. Opportunities for research are exceptionally favourable because of good accommodation and equipment, ample material both in the laboratory and in the field, and adequate library facilities.

2. *The Medical Colleges.*

58. In Western countries, medical research is undertaken chiefly in the various departments of the universities, medical colleges and teaching hospitals. Research is, in fact, an almost universal activity in such institutions and is regarded as a normal function. Additional funds for research work are often made available by grants-in-aid from public or private sources or from endowment funds.

Broadly speaking, medical research receives little or no attention in the medical colleges of India. There are, of course, exceptions to this general rule. It is probable that the lack of research, which has been universally admitted, is due to a complexity of factors, the most important of which will be discussed below.

The authorities responsible for staffing and financing the medical colleges are usually ignorant of the importance of research in relation to the achievement of a high standard of teaching and the development of a correct attitude of mind in the student. This point has been stressed by many witnesses whom we interviewed and, in the words of one of them, " Research has never been an active interest of Government organizations and facilities for it have had to be slowly wrung out of unwilling administrators. Schemes for the advancement of learning or research are usually shelved under the plea of financial stringency, unless the authorities are stimulated into action by such major catastrophies as wars or epidemics ". In India the vision of the authorities in this respect has been even more limited than in many other countries. As a result of this ignorance and lack of interest at the top, the practice has been to restrict the teaching staff of individual departments to the minimum necessary for the conduct of routine teaching duties and, in some cases, provision for these has been inadequate. In many cases the authorities have, in their efforts to curtail expenditure, not only reduced teaching staff below an efficiency level but have reduced their emoluments below a reasonable living wage. Teachers in the medical colleges have consequently been compelled to indulge in private practice in order to

supplement their incomes with the result that their interests and energies have been diverted from academic pursuits.

In the opinion of some witnesses lack of research is due primarily to the absence of adequate accommodation and equipment; others maintained that a potent cause was to be found in the failure to recruit the right type of men; and others again cited over-security of tenure in teaching appointments as a strong contributory factor since this removed incentive to original investigation. In his evidence, Professor A. V. Hill, Secretary of the Royal Society, said that in the medical colleges which he had visited since coming to India research was almost non-existent. In the pre-clinical subjects the head of the department was often the only member of the staff who was adequately paid. The number of assistants was in most cases, insufficient and even those available were so poorly paid that they were compelled to supplement their incomes by private practice. In the clinical subjects the greater part of the teaching was done by part-time workers most of whom were engaged in lucrative private practice. Individual members of the Committee expressed their general agreement with Professor Hill's appreciation of the situation.

During our visits to the different medical colleges in India the impressions we formed have, in general, confirmed the generalisations made above and have emphasised the complexity and variability of the factors responsible for the absence of research in these colleges. Speaking generally, medical students in this country complete their studies without coming into contact with planned scientific investigation. This serious deficiency in their training is, in our view, of even greater importance than failure to advance knowledge of the subjects concerned.

We shall now make a few remarks regarding individual institutions.

In the Calcutta Medical College the teaching of chemistry is at present a part-time activity of the Chemical Examiner to the Government of Bengal whose heavy burden of routine work takes up so much of the accommodation available and absorbs so much of his time that research is virtually impossible. This is perhaps the most extreme example in this college though the same tendency was observed in the Pathology Department. In some of the other departments lack of accommodation was not found to be a primary factor in preventing the development of research but some other factor would militate against research as, for example, lack of suitable equipment, insufficient assistants, or even absence of incentive on the part of the head of the department.

The record of research in the Madras Medical College shows clearly that the output has varied in accordance with the energy and enthusiasm of individual workers. Thus, in the Anatomy Department 20 of the 25 papers published were contributed by one author, while in the Department of Operative Surgery one individual has been responsible for all of the 56 papers published. This College now maintains a "Research Department" the activities of which are directed mainly to work on indigenous drugs

but work on other subjects, such as hormones, is also being carried out. Very little clinical research, in the true sense of the term, has been undertaken. An investigation on chronic fluorine poisoning in which the clinical, radiology and biochemistry departments co-operated provides a notable exception. In this college research is not limited so much by lack of accommodation and equipment as by the heavy teaching duties and other extra-academic responsibilities which the professors and their assistants are required to undertake. Nevertheless, it is apparent from the sporadic research activities of enthusiastic individuals that it is not impossible to attempt research, even though conditions may not be suitable for organized team work.

The same remarks apply in general to the Stanley Medical College, Madras, which has recently been raised from the status of school to college. In this college, however, accommodation and equipment are poorer. The only department in which any appreciable amount of research has been attempted is Surgery from which 66 papers have been published, all of them having been contributed by a single individual.

The Vellore Medical College, like the Stanley Medical College, has recently been converted from a medical school into a college. This College is staffed by enthusiastic workers and is likely to develop as an active research centre. New modern buildings have been provided but, owing to war conditions, these have not yet been adequately equipped for research.

The Agra Medical College has recently been raised from the old Agra Medical School but it is at present so short of accommodation and so poorly equipped that it would be impossible to undertake research on any appreciable scale. In some departments there is undoubtedly a genuine desire to do research work but it would be difficult to conceive of University departments with fewer facilities for it. In the Pathology Department, for example, the professor's room is a short length of enclosed verandah while the reader and demonstrators share a room used also as a routine diagnostic laboratory. Other departments are little, if any, better.

King George Medical College, Lucknow, is in every respect better suited for research. This college is under the direct control of the University of Lucknow and this may help to account for greater research activity than in most other medical colleges in India. In most departments accommodation and equipment are limited and routine teaching duties are heavy but despite these handicaps, research work on a restricted scale is attempted in each of the pre-clinical departments. There is abundant clinical material in the hospital associated with the College but little opportunity for research.

Research has never been a major activity in the Lady Hardinge Medical College for Women, Delhi. The staff of the various departments are so limited that those available are fully occupied with teaching and other routine duties. In the hospital attached to the College the physicians and surgeons are so busily engaged

with hospital routine and teaching that there is little opportunity for research. Apart from these difficulties, the heads of the various departments have from time to time been persons with little or no training for, or experience in, research work. Commendable efforts have, however, been made to conduct research in physiology and biochemistry.

Important research work has been done in the Seth G. S. Medical College, Bombay, especially in the Departments of Physiology and Pathology. In the former, researches on nutrition have been carried out with the aid of grants from the Indian Research Fund Association, although the accommodation and equipment available in this department are extremely limited. In the Pathology Department accommodation is more spacious, equipment is good, and there is a full complement of wholetime teaching staff. Important research work has been done since this department was re-organized by Dr. Khanolkar. The Departments of Anatomy and Pharmacology provide few facilities for research owing to shortage of staff and lack of accommodation. The equipment in the latter department is good but accommodation is so limited that it is not possible to make the best use of it. All of the teachers in the Clinical Departments of this College are part-time workers receiving honoraria with the result that they find time only to fulfil their obligations for the routine teaching of their students. The Grant Medical College, Bombay, has the benefit of more spacious accommodation in the pre-clinical departments but, in most cases, the equipment available is unsatisfactory for research work.

In the King Edward Medical College, Lahore, accommodation is sufficiently liberal to allow of a limited amount of research work and equipment is, on the whole, satisfactory. The chief impediment to the development of research in this college has been an insufficiency of personnel. Research work has been undertaken sporadically on a variety of subjects in the Departments of Anatomy, Physiology, Pathology and Pharmacology and, in some cases, grants have been received from the Indian Research Fund Association. At the present time research work is being done in the Anatomy and Pharmacology Departments. Research on nutrition problems is at present in progress in the Chemistry Department of the Punjab University. There are two other medical colleges in the Punjab, namely, the Balak Ram Medical College, Lahore, and the Glancy Medical College, Amritsar. The former has only recently been founded and is not yet staffed and equipped for research work, while the latter has recently been raised from the status of school to college.

It is clear from this brief survey of representative medical colleges that research receives very little attention. It is significant, however, that in spite of many apparent difficulties enthusiastic individuals have found it possible to devote much time and energy to research. This lends support to the evidence of some witnesses that one of the chief reasons for the absence of research is inaptitude or lack of initiative, incentive and enthusiasm on

the part of many of the teachers employed. It is noteworthy that very few inquiries under the Indian Research Fund Association have been undertaken in departments of the medical colleges. Many of the difficulties in the way of research, such as insufficient assistance, equipment and material, could be overcome if the assistance of the Indian Research Fund Association were sought.

3. *The Medical Schools*

59. The remarks made above regarding research in the medical colleges of India apply even more forcibly to the medical schools. Accommodation and equipment are much poorer than in the colleges and the teachers employed are, on the whole, less highly qualified.

V. Medical Research Financed by the Indian Research Fund Association.

1. *Malaria Institute of India* (Research Section).

60. As has been indicated above, the Malaria Institute of India was originally founded and maintained by the Indian Research Fund Association. In 1940, the public health activities of this organization were taken over by the Government of India and the research functions continued to be financed by the Indian Research Fund Association. The so-called public health and research functions of this Institute are so closely integrated that their separation is in reality impossible. The research functions of the Institute have already been dealt with under the heading " Malaria Institute of India " in that section of this Report which deals with Central and Provincial Laboratories.

2. *Nutrition Research Laboratories, Coonoor.*

61. These Laboratories are housed partly in the Pasteur Institute, Coonoor, and partly in buildings about 100 yards from the Institute. The latter buildings were constructed originally as a jam factory but have since been extensively re-modelled and expanded to make them suitable for laboratory work and the housing of experimental animals. Existing accommodation may be regarded as adequate for present needs and limited space is available for further expansion. The laboratories are well equipped for nutrition research work. In normal times such apparatus as is necessary for particular lines of work is easily obtained but since the war it has been difficult to procure new apparatus from abroad or to repair existing equipment which has gone out of order.

The staff of the laboratories at present consists of a Director, Assistant Director, and seven or eight research workers including chemists, biochemists and medical workers. There are five laboratory assistants, six laboratory attendants, three clerks and some 14 inferior servants, mainly animal attendants.

The laboratories possess a good collection of books on nutrition and receive an adequate selection of periodicals. They also share the extensive library of the Pasteur Institute and the library resources thus provided are adequate for the work undertaken.

The chief functions of the laboratories are to conduct research on problems of nutrition, to act as an advisory bureau on all questions of nutrition, to do a limited amount of routine work, and to hold annual courses on nutrition.

The research activities of the Nutrition Research Laboratories are well known all over the world. The credit for their development belongs to Major-General Sir Robert McCarrison, I.M.S. (retd.), who first outlined, and demonstrated the importance of nutritional problems in India. McCarrison's work began with an investigation of the effects of faulty diet on the thyroid gland but he subsequently extended the range of his researches to cover the pathological changes caused by defective diet in most of the organs of the body. McCarrison's earlier work was financed by the Indian Research Fund Association as "Beri-beri Inquiry" and later as the "Deficiency Diseases Inquiry" and it was not until 1925 that the "Nutrition Research Laboratories" were established on a semi-permanent basis. Since 1925, the research activities of the Laboratories have been progressively extended. Considerable attention has been given to the study of the nutritive value of foodstuffs and data have been compiled regarding the content in most common Indian foods of calories, protein, fat, carbohydrate, calcium, phosphorous, iron, vitamins, etc. Dietary surveys have been carried out in many parts of the country and the state of nutrition in children has been extensively studied. Diseases related to nutrition, such as keratomalacia and stomatitis, have also been investigated. In later years the scope of nutrition research has become progressively wider and during the past decade some 150 scientific papers, covering many aspects of the nutrition problem, have been published. Research has suffered since the war owing to trained workers taking up military service. Work has, however, continued and the present research programme includes further investigations on the nutritive value of foodstuffs, methods of vitamin testing, basic nutritional research, animal experimentation and clinical investigations.

Advisory work has become a heavy burden on the Director of the Laboratories. All requests for information and advice are carefully considered, the literature on the subject scrutinized, and every effort is made to provide accurate replies which will be of practical value to the inquirer. Advice is sought by the Public Health Commissioner with the Government of India, by the Department of Food, by various Central and Provincial Government Departments, by commercial organizations concerned with the feeding of labour, by missionary organizations, etc. The Director is also Honorary Consultant in Nutrition to General Headquarters, India.

At present the routine work of the Laboratories includes vitamin testing on behalf of the Inspectorate of Foodstuffs and the Department of Food as well as other Central or Provincial Government Departments. Samples of fish-liver oils are tested for vitamin A. Generally speaking, tests are carried out only on foods which are of importance in connection with the food

situation in the country or with the war. Tests are not done for commercial organizations although requests for such are frequently received.

A course of instruction on nutrition lasting about 10 weeks is held annually, usually in the months April to June. These courses have been attended by health officers, medical practitioners, agricultural officers, senior nurses, school teachers, etc. Up to the present, eight such courses have been held. Post-graduate students from other research organizations are occasionally admitted for periods of a few months for special studies, but normally voluntary workers are not provided with facilities to work on nutrition problems. Two research scholars, provided for under the Parlakimedi Trust Fund, are employed for three-year periods with the object of training young workers in nutrition.

In order to educate the public in nutrition, three popular bulletins have been published in the Government of India Health Bulletin Series. One of these, " The Nutritive Value of Indian Foods and the Planning of Satisfactory Diets " has achieved a wide circulation and has run into three editions. General articles are published from time to time in medical and other journals. Lectures and broadcasts are given as opportunity occurs. A nutrition museum is maintained in the Laboratories and attracts numerous visitors. By such means the results of nutrition research are brought to the attention of the public.

3. *Regional Nutrition Research Units.*

62. On the advice of the Nutrition Advisory Committee, the Governing Body of the Indian Research Fund Association recently sanctioned the creation of two Nutrition Research Units, one at Bombay and the other at Dacca. The establishment of these two units followed naturally on the continuous series of investigations on nutrition carried out at these two centres under the auspices of the Indian Research Fund Association for a number of years past.

Research on nutrition has been undertaken in the Physiology Department of the Seth G. S. Medical College, Bombay, for the past fifteen years. These researches were, to a large extent, financed by the Indian Research Fund Association and covered a wide field of investigation, especially on the nutritive value of pulse protein; cheap, balanced diets; nutritive value of fish, including vitamin content of liver oils obtained from them; the effect of parching on pulses and cereals; calcium metabolism; requirements of dietary fat in the tropics; nutritive value of soya bean, etc. Nutrition inquiries under the Indian Research Fund Association were formerly carried out independently by Dr. S. P. Nivogi and Dr. V. N. Patwardhan. With the creation of a Nutrition Research Unit at Bombay these inquiries have been amalgamated under the joint direction of these two workers. The staff of the Unit consists of three research assistants, one laboratory assistant and two laboratory attendants, in addition to the joint directors. The unit is based on the Physiology Department of the Seth G. S

Medical College. The accommodation and equipment available to this Unit are very limited at present and if this Unit is to attain adequate status as a regional centre for nutrition research, it will be necessary to provide increased accommodation, greatly improved equipment and much better facilities for experimental animals. The Unit at Dacca is organized on similar lines. The annual grant for each of these Nutrition Research Units has been fixed at Rs. 12,000 per annum in the first instance. The Units will follow a plan already adopted by the Nutrition Advisory Committee and will pay special attention to problems of local importance. In the first instance researches will be carried out on the composition of the lesser known foodstuffs consumed locally and the influence of various cooking processes on the more important food constituents.

The Indian Research Fund Association has also financed numerous other inquiries on nutritional problems at various centres throughout the country.

4. *Miscellaneous Inquiries under the Indian Research Fund Association.*

63. Since its inception in 1911, the Indian Research Fund Association has financed a large number of special laboratory and field inquiries on a very wide variety of subjects. Applications for grants for research on any subject with a medical or public health bearing may be submitted by any suitably qualified and experienced person who has the necessary facilities for carrying out the proposed programme of work. As has been indicated above, some of the inquiries originally instituted under the Indian Research Fund Association developed so successfully that they became semi-permanent in character, and, in one case (the Malaria Survey of India) was ultimately taken over in part and constituted as a permanent Central Government Institution. Reference has already been made to the Nutrition Research Laboratories, Coonoor, which have attained a position of virtual permanency. The Kala-azar Commission, which was originally constituted on the recommendation of the Scientific Advisory Board of the Association, continued to carry out an extended investigation on this disease for nearly a decade. Similarly, a special inquiry on cholera was set up and continued to function for 8 years. A large part of the Association's activities have, however, been carried out by making grants-in-aid to research programmes put forward by individual workers. Such grants have been given not only to workers on the staff of Government laboratories and teaching institutions, but also to workers in universities, medical colleges, and other laboratories, or to workers in the field.

All applications for grants for research work are carefully considered by the Scientific Advisory Board and by the Advisory Committees constituted by this Board, and it has often been claimed that no reasonable proposal for research has ever been turned down.

Applications for grants from the Indian Research Fund Association have been received mostly from workers on the staff of Government laboratories and teaching institutions, and comparatively rarely from depa.tments of the universities and medical colleges in India. The reasons for the paucity of applications received from departments of medical colleges in India have been considered elsewhere in this Report.

Special inquiries under the Indian Research Fund Association enjoy a freedom from official interference, which has made research work under the Association very popular with officers in Central and Provincial Government laboratories. The work achieved is subject to annual review, and so long as there is evidence that the investigations have been energetically pursued and remain promising, grants are ordinarily continued from year to year.

The system of giving grants-in-aid to research workers whose emoluments are found from other sources has released the bulk of the Association's funds for the provision of extra technical assistants, specialized apparatus and equipment, experimental animals, etc., for the work undertaken.

One of the great benefits of the Indian Research Fund Association is that money can be made available for research work at short notice without the delays ordinarily occasioned by obtaining sanction for the release of funds directly from Government sources. Recently, for example, it has been possible to set up almost immediately special investigations into the care and treatment of sick destitutes during the famine in Bengal and also to establish, at short notice, an inquiry into typhus fever in various parts of India.

Within the limits of the financial resources of the Association, the numerous inquiries which it has financed have done much to bring to light knowledge which has proved of real importance in the epidemiology, mode of transmission, diagnosis, treatment and investigation of many of the more important diseases in India. Inquiries financed by the Association over the past 20 years have also helped to elucidate the resources of the country in regard to the use of indigenous drugs.

VI. Medical Research carried out by other Organizations.

1. *The Pasteur Institute of Southern India, Coonoor.*

64. The Pasteur Institute of Southern India was opened at Coonoor, Nilgiris District, in 1907. The major portion of the necessary funds was provided through the munificence of Mr. Henry Phipps, an American Philanthropist.

The Institute is the property of the Pasteur Institute Association which is a body registered under the Societies Registration Act of 1860. The management of the affairs of the Association is vested in a Central Committee of which the Surgeon-General with the Government of Madras is Chairman and the Director of the Institute is Secretary.

During the early years of its existence, the Institute was maintained to a large extent by voluntary contributions, although the salaries of the Director and other medical staff were borne by the Government of Madras. Revenue from the sale of anti-rabic vaccine and from the conduct of diagnostic laboratory work gradually increased and the Institute is now entirely self-supporting. For a time the financial affairs of the Association were so flourishing that a reserve fund of some Rs. 8 lakhs was accumulated. The Government of Madras then withdrew the payment of the emoluments of the medical staff of the Institute but continued to support it by the purchase of all their supplies of anti-rabic vaccine.

The Institute itself is a very well-constructed double-storied building standing in some 13 acres of beautiful park-land. Fine staff quarters and animal houses are available. The climate is ideally suited to laboratory work and for the breeding of healthy animal stocks. In 1938-39 the Institute was completely renovated, re-furnished, re-equipped and re-organized as a model centre for the large-scale manufacture of anti-rabic vaccine, a first-class diagnostic laboratory and a research centre. The Institute possesses a good library and normally maintains a trained librarian.

In the earlier years of its existence, a considerable amount of research work was carried out by the Director and Assistant Director, both of whom were officers of the Bacteriological (now Medical Research) Department. The retrenchment of the post of Assistant Director and the increased volume of routine work curtailed the time available for research for some years. Active research activities were resumed in 1938 when a Research Officer was appointed as a regular Institute employee and an officer of the Medical Research Department was posted supernumerary to establishment. In addition, a grant of approximately Rs. 10,000 per annum was given by the Indian Research Fund Association for research on protozoal diseases (Protozoal Parasites Inquiry). In the following year an inquiry known as " Malaria Investigations " financed by the Rockefeller Foundation was located at the Institute. The Institute has also provided a home for the Nutrition Research Laboratories of the Indian Research Fund Association for many years. As the result of close co-operation between the various organizations and inquiries referred to above, the Institute was a very active research centre when war broke out in 1939. There followed a drastic reduction in the number of officers available for research and by 1941 research activities were again reduced to a low ebb. The renaissance lasted long enough, however, to demonstrate the suitability of the Institute as a centre for research.

2. *Tata Memorial Hospital, Bombay.*

65. This hospital maintains a series of well-designed and equipped research laboratories under the direction of a competent pathologist with long experience of research work. Although established only three years ago the laboratories are now adequately staffed with enthusiastic workers and it is evident that an active centre for medical research has been created. The laboratories are specially suited for research in biochemistry, biophysics, pathology

and clinical subjects especially surgical and radium therapy of cancer. The location of these laboratories in close proximity to other centres of research including the Haffkine Institute and the Seth G. S. Medical College is an additional advantage

3. *Indian Institute of Medical Research, Calcutta*

66. This Institute was founded by private enterprise through the initiative of its present Director, Dr. J. C. Ray. Its development has been retarded by lack of funds but the Government of Bengal has recently agreed to subsidize it to the extent of Rs. 10,000 per annum. Income is derived mainly from the sale of vaccines and other biological products manufactured at the Institute and from fees realized on diagnostic laboratory work carried out on behalf of private practitioners. Research has been a more or less spare time activity of honorary workers and has suffered greatly since the war. The Institute is located in a large residential apartment and is reasonably well equipped for the type of work undertaken. The Director edits a quarterly scientific journal, *Annals of Biochemistry and Experimental Medicine*, which has appeared regularly since 1941.

4. *The Indian Council of the British Empire Leprosy Relief Association*

67. The Indian Council of the British Empire Leprosy Relief Association was founded in 1925, a year after the Association was founded in London. Since then, branches of the Association under the Indian Council have been opened in most of the Provinces in India. The Indian Council and its provincial branches have stimulated interest in leprosy in this country and have undertaken research, the training of medical personnel and the organization of leprosy propaganda. The annual expenditure of the Indian Council is about Rs. 1,25,000. Of this sum more than half is distributed to provincial branches. The research work sponsored by the Council is carried out at the Calcutta School of Tropical Medicine in collaboration with work financed by the Indian Research Fund Association and by the Endowment Fund of the School of Tropical Medicine. Research activities have included clinical, therapeutic, bacteriological and epidemiological studies on leprosy. These investigations have increased the knowledge of this disease and have proved of value in the diagnosis, treatment and prevention of leprosy. Associated with this research work, special post-graduate courses have been held at the School of Tropical Medicine and hundreds of medical officers have already been trained in this way. In addition, lecture-demonstrations are given to the students attending the D.P.H., D.T.M., and L.T.M., courses of the School and the All-India Institute of Hygiene. The Council publishes a quarterly journal, *Leprosy in India*. In 1936, a Centre was established at Bankura for the investigation of the epidemiology of leprosy in rural areas. The results obtained in this Centre have yielded valuable information about the epidemiology of leprosy and have helped the evolution of a scheme for the control of leprosy in rural areas.

5. *The Indian Institute of Science, Bangalore*

68. The Indian Institute of Science, Bangalore, undertakes research work on the basic sciences on a large scale. The only department of this Institute at present engaged in research work which has a direct bearing on medical problems is the Department of Biochemistry. During the past four years, this department has concentrated on the study of biological products of therapeutic value and on methods for their preparation. For this purpose a pharmacologist, a pharmaceutical chemist and a bacteriologist were added to the staff of the department. Research has been carried out on the preparation of rennet, pepsin, pancreatin, insulin, pituitrin, adrenalin, vitamins and other preparations. Some of the products enumerated above have been prepared at the Institute and supplied to Government; in other cases the methods worked out have been handed over for development on a commercial scale by private enterprise. Recently, work on the cultivation of penicillium and the preparation of penicillin has been carried out. Other aspects of the research work of this department have included the study of sewage purification, sewage farming, the treatment of brackish water and the hygienic treatment of industrial liquid wastes. The research work carried out in this department tackles problems not adequately catered for in other laboratories in India and therefore promises to contribute results of practical value.

6. *The Imperial Agricultural Research Institute, New Delhi*

69. This Institute was established at New Delhi after the old Institute at Pusa had been badly damaged by the Bihar earthquake of 1935. The organization and layout of the Institute provide some valuable lessons, perhaps the most important of which are the necessity of allowing ample room for future development and the desirability of providing quarters for all members of the staff. The Institute is well organized and is provided with adequate accommodation, equipment and personnel for the type of work undertaken, which consists mainly of post-graduate teaching and research of an applied nature. The work of the Institute has little direct bearing on medical and health problems. Experiments have, however, been carried out on nutrition, chiefly in the Chemistry Section. For example, the nutritive value of wheat and maize crops raised on land manured with green manure, farm-yard manure and mineral manure has been determined by working out growth curves for rats. The results of these experiments indicate a higher nutritive value of wheat and maize raised on land treated with green manure, a slightly lower value for crops raised with farm-yard manure, and a definitely inferior value for crops raised with artificial manure. The Institute has also taken a keen interest in the cultivation of pyrethrum in India and it has now been established that high-grade pyrethrum containing up to 1.2 per cent. pyrethrines can be grown in the drier areas in India at elevations of 4,000-5,000 ft. in Kashmir, Muree, the Nilgiris and Mysore State. The work of the Institute, although having little direct bearing on medical problems, covers fields of investigation

sufficiently close to medical subjects to make it desirable to obtain a closer liaison between medical and agricultural research than has existed in the past. If the proposed new All-India Medical Institute were established, it is clear that the scientific work in the two research institutes could be of considerable mutual assistance in the solution of scientific problems. The very fine library available at the Institute would be an additional advantage to the new institution, wherever it be located.

The Director of the Institute considered that the climate of Delhi during the hot summer months was unsuitable for many types of work undertaken and stated that the quality and quantity of work done was very much greater during the cold season. He expressed the belief that if all buildings were air-conditioned the quality and quantity of work done during the summer months would be doubled.

7. *University College of Science, Calcutta*

70. The University College of Science, Calcutta, carries out research work of a very high standard in some of the basic sciences which have an important bearing on medical research, particularly on physics and chemistry. At the present time, the only work undertaken in this college, which is specifically related to medical problems, is the work on nutrition carried out under the direction of Professor B. C. Guha of the Department of Applied Chemistry, who receives a grant-in-aid from the Indian Research Fund Association for this purpose. The college is well staffed and equipped to undertake research in the basic sciences and it is felt that its work could, with advantage, be developed to be of great value to medical research in general, particularly in regard to the training of medical research workers in the basic sciences.

8. *Medical Research carried out by Commercial Firms*

71. There are in India to-day an increasing number of commercial concerns engaged in the production of pharmaceutical and biological preparations. Some of these are already firmly established and, as has been pointed out elsewhere, the standard of work of the better-known firms has now reached a much higher level than formerly. In some cases, special research laboratories are maintained, the workers in which undertake investigation in relation to the production of both pharmaceutical and biological preparations. Up to the present, most of these investigations have been directed to the practical production of these preparations but recently articles have been submitted for publication on subjects not directly related to commercial production. It is well known that some of the best known firms in America and Europe maintain their own research laboratories and that a great deal of scientific investigation of the highest quality has been carried out in them. It cannot be said that this stage has yet been reached in India but there are indications that the research activities of the scientific workers of the better known firms in India are likely to increase in the future. It may be presumed that some work of this type

will be regarded as a trade secret but it seems not unlikely that the results of work of general application may be freely published. Research work in commercial firms is to be encouraged as apart from the results achieved, the training and insight gained in its conduct are likely to lead to higher standards in relation to the commercial work undertaken.

J. W. BHORE, *Chairman.*
R. A. AMESUR.
A. C. BANERJEA.
A. H. BUTT.
R. B. CHANDRACHUD.
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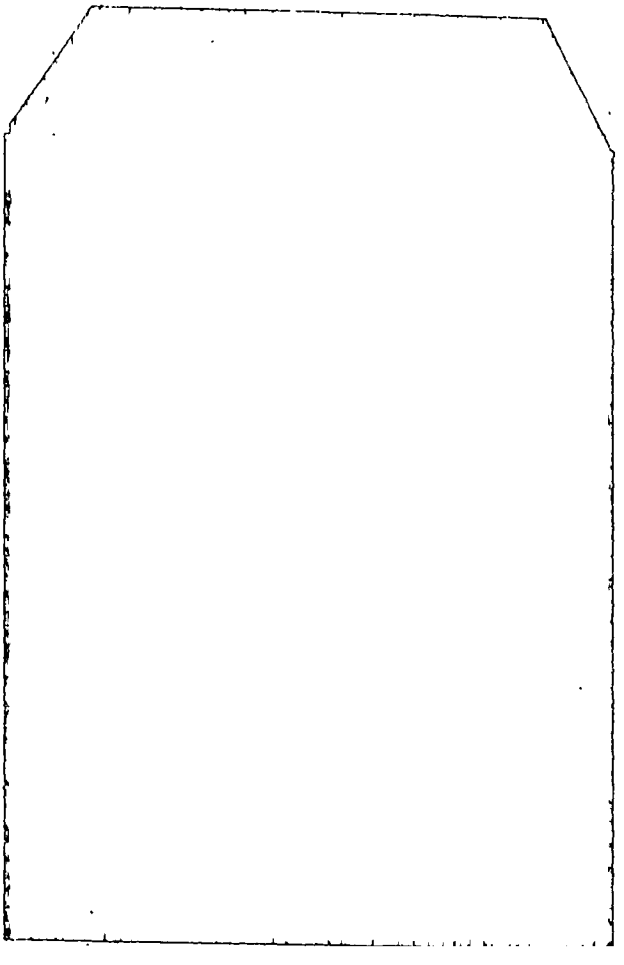

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